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# This Week in The IRON AGE

Vol. 155, No. 13

March 29, 1945

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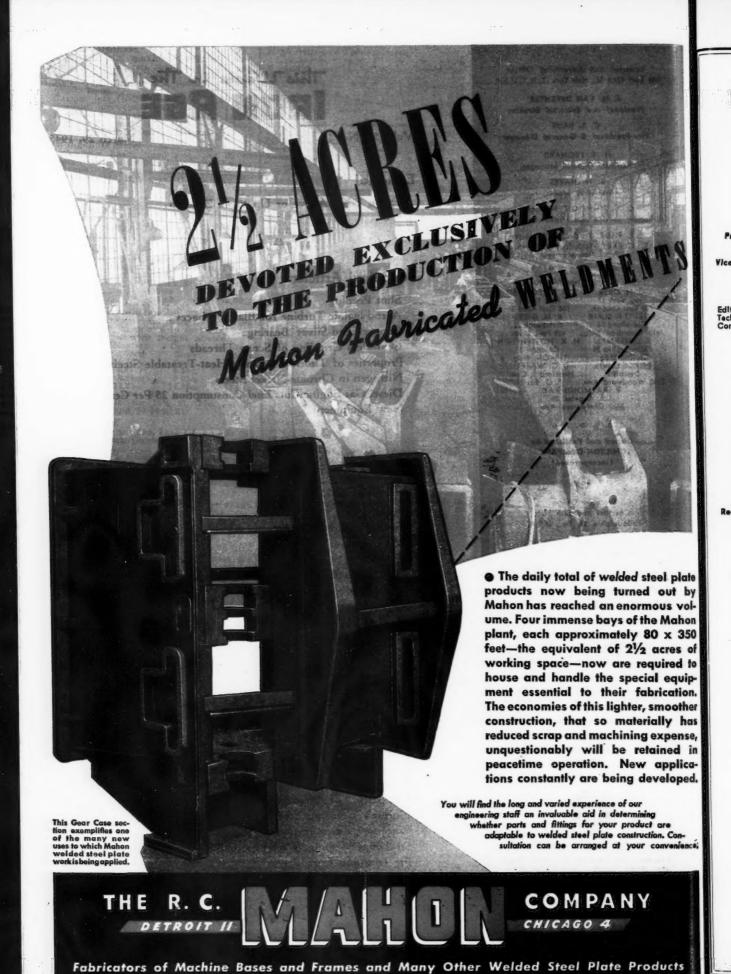
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March 29, 1945

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# Down From Above or Up From Beneath

A PYRAMID that sits on its base is much more stable than one that stands on its head. That is the principal reason why democracy will remain put after most of the "isms" fade from the picture.

In a democracy the apex is less important than the base. True, there must be a top to everything, but in this case the top, or governing section, receives its power from below and is supposed to operate in its behalf. When elected or appointed officials cease doing that, you no longer have a stable pyramid.

This same principle applies to industrial management in a democratic state, for every industrial concern is also a pyramid. The chief executive is the apex and the next layer or horizontal section is the management; next come the stockholders, then the general force of employees and finally, at the base is the slice or section comprising current and prospective customers. As you go down the slices get bigger.

The able top management is characterized by doing most of its planning and thinking for and on behalf of the lower sections of its pyramid. When an executive thinks more about his personal interests and that of his staff and stockholders than he does of the interests of his employees and his customers, his pyramid is standing on its head and is likely to topple.

In industry, the power to keep a concern on a stable footing comes from below even though the ability to direct that power is at the top. This force is purchasing power. And you find that at the base of your pyramid and not at the apex.

Our most successful businesses have been operating on this principle for quite some time. But it is going to be necessary for all of us to broaden the base of our thinking if we are to solve our coming postwar problems. We must find how to increase the number of our customers at a rate to balance our flow of products.

Some people plan to do this by capturing a part of the other fellow's market. But the day has passed since this has been a satisfactory solution. It won't do what will be necessary to keep the big American economic pyramid on its base. Because we have reached the state of development and refinement that makes our little individual pyramids no longer self-sufficient, but parts of the big national one. There will be no future for America if the little pyramids just keep competing for the "status quo ante" business within the big pyramid. So we have the job of making more customers and better ones. And just putting new products on the market will not do it. Cramming our new defense plants with workers to turn out more products will not do it. Nor will putting more people on government payrolls to do less work do it.

The solution lies simply in the increase of actual national purchasing power, which means purchasing power from income and not from debt. And that can be accomplished only by discarding the higher mathematics and astrology of economic verbosity and getting down to brass tacks.

It is a three-cornered problem in which management, labor and government each have a definite part. Management and labor together must increase productivity per unit of farm and factory. Management then must translate these efficiency gains into more buying power through larger total wages and lower prices. Government must aid by reducing its depletion of purchasing power through economies reflected in tax relief.

Only through the adoption and fulfillment of these policies can the big pyramid and the little ones inside of it be kept upright.

Attous vents



# Round-the-Clock Carloading at Inland

Carloading and prompt dispatch of cars from the mill are important to Inland because they are important to Inland's customers. These round-theclock jobs have been intensively studied, resulting in improved packaging and carloading despite full rolling schedules, shortage of some types of railroad equipment, scarcity of bracing, etc.

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the products of other mills to the car. Throughout each hour of the twenty-four, expediters keep steel flowing to loading points and as soon as cars are loaded, they are switched to the railroad yard where they are assembled for quick dispatch to our customers.

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Plas note

We invite you to confer with an Inland shipping specialist. He will gladly study your loading, unloading, and shipping problems, giving you all available assistance under the conditions of war, and helping you plan for speedier and more convenient delivery of steel for use in time of peace.



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# NEWS FRONT

Latest V-rumors: Stockholm's Tidningen reports that one of the principal inventors of Germany's V-1 and V-2 weapons has escaped from Denmark to Sweden. He states that V-2's were developed capable of reaching New York. They weigh 15 tons, are fired at an angle of 75 deg. and reach a height of 200 miles in less than 2 min.

Also: reports from the French via Ankara have it that Danish patriots successfully sabotaged a number of special launching devices which were to be used on U boats for

giving New York a dose of V-1's.

Takeo Shimio, a Japanese war correspondent, was so sorry to report in a broadcast from Tokyo that Japanese airmen in the Philippines were dissatisfied with the workmanship on the airplanes sent to them. Replacement parts arrived with loose rivets and old bits of metal in motors. Several aircraft were lost because wings fell off during flight, and more and more aircraft are returning to their bases because of faults, according to Shimio.

► The Army now is getting sizable quantities of heavy truck tires and heavy duck fabric out of French industries. The raw materials of course had to be shipped from

this country.

French industries were a little dubious about American synthetic rubber, after using the German synthetic for years. The first shipment of American synthetic, however, was an agreeable surprise.

Rating natural rubber as 100, the American synthetic rates about 90, whereas the best German synthetic worked by the French would rate in the neighborhood of 50.

Apparently German technological advances in rubber were not as great as had been

expected in this country.

▶ Other than the small and isolated recovery of a few industries in several areas of France due to American imports and production for the Army, the remainder of French industry is at a standstill. The economy of the country continues to deteriorate and an internal explosion is in the making.

► A metering device which will introduce a flow of water and alcohol into the carburetor injection stream of an internal combustion engine is now in production that

will add about 15 units of octane power to the fuel.

The device automatically turns on when the motor starts knocking, regulated by

vacuum in the intake manifold.

- ► The surplus disposal confusion described by the Mead Committee report is the culmination of much comment on the number of war agencies with interests in the field. Despite criticism of the Surplus Property Board, it will get greater authority, while most other agencies will be weeded out.
- ► Alloying stainless steels with nitrogen offers materials which combine high tensile strength (256,000 to 285,000 lb. per sq. in.) with absence of magnetism. austenite-stabilizing action of nitrogen is favorable, furthermore, in all cold-deformation processes, especially in the manufacture of deep drawn parts.
- Possibility of Detroit's losing its status as a critical No. 1 labor area was foreshadowed by WMC Chairman Paul V. McNutt. Both industry and labor groups in Detroit are pressing for this change. However, WMC spokesmen say that military contracts soon to be added to those already in the auto center area will absorb temporary labor surpluses.

Rumors are circulating that the Cramp Shipyard will be closed. Submarine contracts which had already been started at Cramp have been transferred to another yard

and the incompleted hulls scrapped.

Detroit's Plan Commission predicts unemployment in that city of 150,000 after the war, and the deficiency may rise as high as 300,000. This figure is offered in spite of the Commission's expectation that Wayne County will be able to provide jobs for 1,000,000 to 1,200,000 persons. In 1940, there were about 887,000 persons employed.

The commission study strongly recommends diversification of the city's industry, pointing out that at present about 80 per cent of it lies in the automotive sphere. Plastic and chemical products, aviation, prefabricated housing, rubber and glass are noted as opportunities for industrial expansion.

# Mechanical And

# Metallurgical

# Advantages Of

# **Shot Peening**

OSTWAR problems in equipment design will be influenced by many practices extensively applied during the war. The benefits from some of these practices are so outstanding that competitive conditions in peacetime equipment design will demand a new appraisal by engineers as to the technical and economic factors of the strength-weight ratio, space, and cost. The process of compressing the surface layer of design members, such as shot peening, offers one means of improving these factors on the basis of its significant application to wartime and prewar equipment.

Most equipment is subjected to dynamic loading or repeated stressing of the design members, and in such cases the process of shot peening has contributed much toward improving fatigue resistance. In fact, merely adding the operation of shot peening

... An engineering appraisal of the technical and economic utility of compressing the surface layers of design members as a means of greatly improving their fatigue resistance. In this first section of a two-part article, the author details the history of shot peening, describes the treatment of coil and leaf springs, sandblasting effect on fatigue, tempering after peening, and the peening of torsion springs and drive shafts.

to machinery and ordnance parts has often meant the difference between failure and successful performance in service. Outstanding

examples will be presented illustrating the manner and benefits by which these technical developments in shot peening and other forms of cold working the surface are being applied to various types of design members.

By O. J. HORGER and of Railway Engineering

Head of Railway Engineering and Research, Timken Roller Bearing Co., Canton, Ohio Fatigue failure generally initiates at the surface where the stress is often greatest and boundary conditions unfavorable. Therefore it is pare

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only natural that consideration be given to means of preparing and improving this surface layer. Increasing recognition is being given to shot peening or other means of cold working as a surface treatment which not only (a) increases fatigue resistance but which in some instances has simultaneously eliminated the (b) necessity for polishing and (c) even machining the surface after heat treatment and yet serve as a means of (d) cleaning or descaling. Obtaining maximum fatigue resistance by shot peening presumes a knowledge of the proper kind and intensity of blast upon the member and how various materials, surface conditions, and shapes of design members respond to cold working. Demands for the commercial application of shot peening have been so great that its requirements have much exceeded knowledge of fundamental factors controlling the process. An analysis of the history surrounding this process indicates that about 16 years have elapsed since the time that the beneficial effects of surface cold working were first given technical recognition.

The American spring industry was the first to make practical application

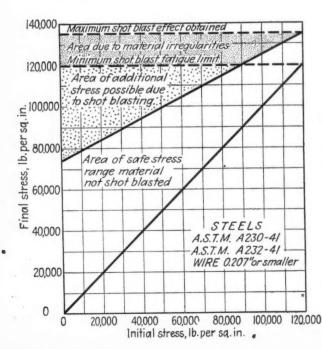


FIG. I — Modified Goodman diagram showing greater allowable stresses permitted on shot peened springs of pretempered wire (Gibson Co.).

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F 1G. 2—Shot peened coil and Belleville washer springs. (Zimmerli).

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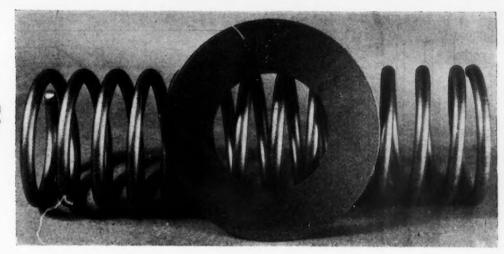
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of shot peening. Zimmerli\* was apparently the first to publish technical papers¹ on shot peened valve springs, and stated that in 1929 the company with which he was associated sent out the first production springs in this country shot blasted to increase fatigue strength. His progress was difficult because he describes it by say-

ing: "These springs were first unnoticed, then protested, and for a year or two our work was endured but not encouraged. After that, adoption was rapid until today this method is specified on many prints." Steeleb also utilized shot blasting on production springs2. Gagnone stated that since 1935 advantage was taken of this metallurgical advance by shot blasting such important automobile car parts as axle shafts, connecting rods, steering arms, center arms, support arms and a few others with the result that fatigue failures were almost a thing of the past. Clutch spring discs for Chevrolet would not work until they were shot blasted.

Almend has devoted much effort to

the development and application of shot peening to different kinds of machine elements, some of which is published in available literature5. He is acting as a centralized authority for assisting manufacturers engaged in the war effort to improve the fatigue resistance of their product by shot peening. His experiences have made him an outstanding authority; other investigators all concur with his findings as to the marked improvement in fatigue resistance obtained through shot peening, but some disagree as to the best means of accomplishing this and the reasons for such improvement. Exceedingly little data have been released in available publications regarding the merits of shot peening

<sup>a</sup> Chief engineer, Barnes-Gibson-Raymond Division of Associated Spring Corp.

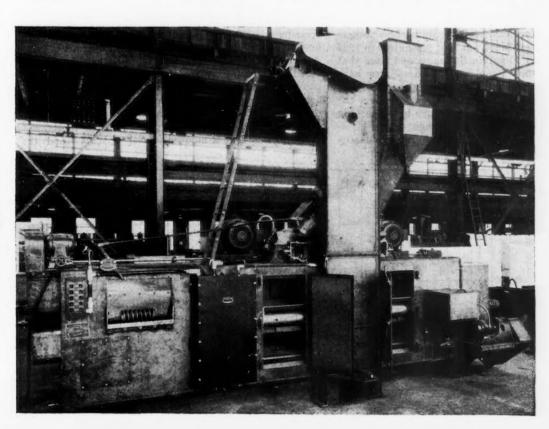
b Chief engineer, Spring Division, Eaton Mfg. Co.

<sup>c</sup> Chief metallurgist, Hudson Motor Car Co.

<sup>d</sup> Head of Mechanical Engineering Department, General Motors Research Laboratory.

FIG. 3 — Wheelabrator unit for peening larger coil springs.

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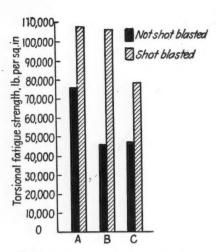
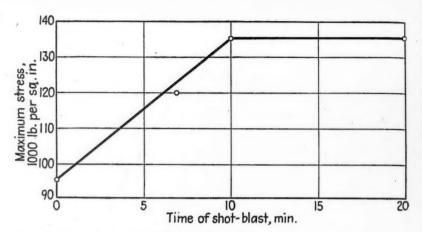


FIG. 4—Increase in fatigue strength of helical springs by shot blasting (by Lupfert) oil quenched and tempered steel wire 0.118 in. diameter with tensile strength 205,000 to 235,000 lb. per sq. in.—(a) without surface defects, (b) with small surface defects and (c) with surface laps.

but many investigators have made fatigue tests on actual production parts and laboratory specimens. While much of these data remain restricted until after the war there are numerous cases which may be cited to stimulate still further interest and appraise this beneficial process in terms of present and post war products.

Practical production applications outlined above were supported by technical developments in various laboratories in several different countries. The beneficial influence of surface cold working to increase fatigue resistance was first recognized in 1929 by Foppl<sup>6</sup> in Germany, and since that time Foppl and his associates have published at least 50 papers on this subject. In most of these papers the cold working was done by burnishing rollers, and although shot blasting was discussed, German industry



F 1G. 5—Effect of time in shot blast on test springs; 1 7/32 in. O. D. coil, 1/64 in. or 3/64 in. shot size, minimum stress 20,000 lb. per sq. in., heat 20 min. at 500 deg. F. after shot-blast. (Zimmerli.)

lagged much behind American industry in its practical application to production parts. Foppl' stated in 1942 that THE IRON AGEs in 1930 was the first to publish the results of his findings in America and that this publication made a greater impresson in America than the many papers he and his co-workers had issued at the same time in Germany. Evidently this process of surface cold working to improve fatigue resistance was accepted by German industry with considerable reluctance because he reported that Amercan industry immediately recognized the importance of his new method and introduced it into practice.

He related that the blasting of valve springs, for the purpose of increasing the fatigue strength, was first employed to a large extent in America and from there was introduced in Germany by the Opal company. He recites the fact that the firm of Rochling, who patented the steel shot blasting method in Germany, did little toward applying this process to springs so that a number of Germany.

man companies had to import blasting machines from America. It was as late as 1942 when he wrote "recently, however, the ice seems to have broken in Germany" in referring to the use of surface compression to highly stressed parts. Wiegand10 in 1940 wrote that the practice of shot peening valve springs was started in Germany in about 1938 using steel balls around 0.040 in. in diameter. It was only then that it became possible to increase the endurance of springs so that a fatigue fracture in a correctly manufactured valve spring seldom occurred.

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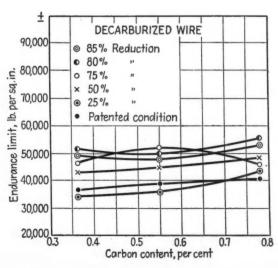
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In 1927 in England, however, Herbert<sup>11</sup> reported on hardening by "cloudbursting" parts with steel balls, for reasons other than obtaining increased fatigue resistance, but no statement can be found indicating that he recognized important increases in fatigue strength by this process. Weibel<sup>12</sup> in 1935 was the first to show that increased fatigue resistance could be obtained by shot blasting. In the same year Peterson and Wahl<sup>12</sup> and the author<sup>14</sup>, <sup>18</sup> also re-



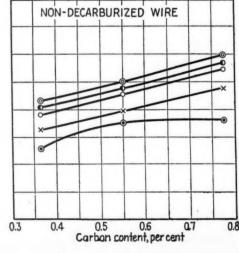


FIG. 6 — Influence of carbon content and decarburized surface layer on the rotating bending fatigue strength of patented drawn wire. (Gill and Goodacre.)

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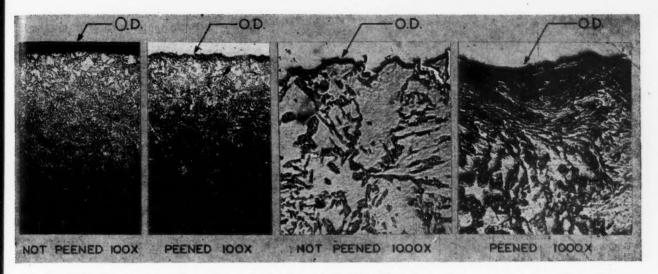


Fig. 7—Microstructure at surface before and after shot peening NE 8650 steel quenched and tempered to 444 Brinell.

ported large increases in fatigue resistance by cold working using burnishing rollers. The specific subject of shot blasting as it was related to improving fatigue properties received no further attention in the technial literature until 1938 by Frye and Kehl16. Then Foppl<sup>17</sup>, .Zimmerli<sup>1</sup> and Wiegand10 published results in 1940. Results of Lessells and Murray18 as well as Manteuffel19 appeared in 1941. Two additional papers appeared in 1943; Almen<sup>5</sup> gave results of fatigue investigations made on various kinds of shot peened automotive parts and Luppert20 presented results of German tests. In 1944 three technial papers, 23, 22, 23 and a review24 were presented; also a symposium on this subject was held by American Society for Metals at their annual meeting.

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## Coil Springs Shot Peened

It is easily understood that the engineer often finds it more desirable to prevent fatigue fractures by increasing the dimensions than to employ seemingly new methods of compressing the vulnerable surface layers. In the case of springs, however, increasing the dimensions is certainly an unsatisfactory method; the spring would become more rigid and therefore impair its characteristics as a spring. This design limitation lent encouragement toward the development and later wide acceptance by the spring industry in adopting shot peening as a surface treatment.

An engineering expression of the value of shot peening coil springs of pretempered wire is shown by the modified Goodman diagram in Fig. 125. Here the permissible range of stress from minimum to maximum is given for peened and not-peened springs, for which the wire diameter does not exceed 0.207 in., of plain carbon or

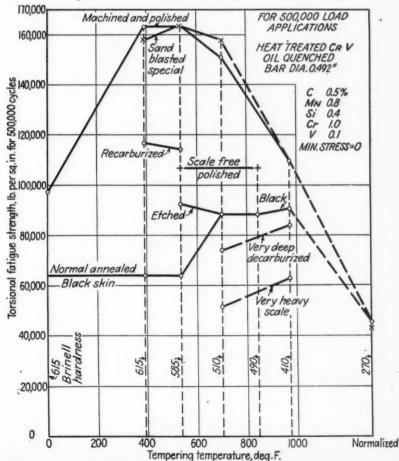
chromium-vanadium steel of valve spring quality. The designer would interpret Fig. 1, for instance, to mean that the allowable maximum stress on a peened coil spring could be increased by the amounts shown in the Table I above that for a spring not shot peened.

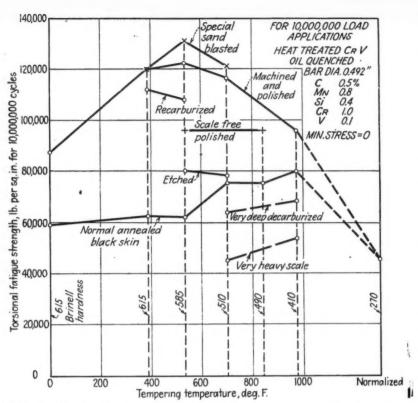
Table I is based on values used for long-life springs; the stress given in-

cludes the Wahl correction factor to give the actual stress on the inner surface of the wire where it is a maximum.

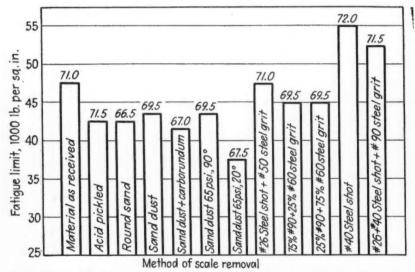
Two typical shot peened springs are illustrated in Fig. 2. Coil springs are peened in production using a machine of the type shown in Fig. 3. Here the spring rotates under the shot stream

FIG. 8—Influence of surface conditions and tempering temperature upon torsional fatigue resistance for 500,000 load applications. (Manteuffel.)





F1G. 9—Influence of surface conditions and tempering temperature upon torsional fatigue resistance for 10,000,000 load applications. (Manteuffel.)



F IG. 10—Graphical presentation of fatigue limits resulting from descaling by various methods. Numbers above columns indicate superficial hardness numbers, N15.

(Frye and Kehl.)

Increase of	TAB Allowable Maximu Peened C		-Peened and
Minimum Stress on Peened or Non-Peened Spring, Lb. Per Sq. In.	Maximum Stress Allowable, If Not Peened, Lb. Per Sq. In.	Lower Range of Maximum Stress Allowable, If Peened, Lh. Per Sq. In.	Minimum Increase in Stress Permitted by Peening, Per Cent
25,000 50,000 70,000 90,000	74,000 90,000 100,000 110,000 120,000	120,000 120,000 120,000 120,000 120,000	62 33 20 9

in such a manner that the shot passes between the coils so as to hit the inside surface of the wire where the highest stress is located under service loading. Coil springs made from bar stock up through 14-in. diameter, and using different types of plain carbon and alloy steels are being shot peened in many plants in this country and abroad as regular production operations. In the machine shown in Fig. 3, the shot is fed into the center of a rotating wheel and then accelerated by vanes to the outer periphery of the wheel where it is discharged at considerable velocity. Other types of machines use compressed air to accelerate the shot against the coil.

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Bollenroth and Bungardt<sup>28</sup> even used the ball head of a hammer to peen the surface of about ½ in. diameter drawn tension wire, and found that this operation increased the rotating bending endurance limit from 64,000 lb. per sq. in. to 79,700 lb. per sq. in., or an increase of 25 per cent. They used a plain carbon wire of 0.45 per cent C and less than 0.35 per cent Si and 0.8 per cent Mn, heat treated to 170,700 lb. per sq. in. tensile strength.

German results by Lupfert20 in Fig. 4 indicate that the torsional fatigue resistance of spring wire may be increased by shot peening even though surface defects are present on the wire. In condition A of Fig. 4 the fatigue resistance is increased 40 per cent by peening wire having no defects. The wire in B had certain surface defects such as decarburization, flat or shallow scars and ridges and yet peening gave an increase of about 130 per cent. Wire with surface laps in C was improved 66 per cent by peening where the shot could not even penetrate to the bottom of the surface

Zimmerli<sup>1</sup> reported that valve springs of 0.162-in. diameter wire from heat treated plain carbon steel (0.65 per cent C, 0.58 per cent Mn, about 200,000 lb. per sq. in. tensile strength) without surface decarburization or defects gave an endurance limit value of 95,000 lb. per sq. in. for non-peened springs as compared with 135,000 lb. per sq. in. when peened, or an increase of 42 per cent, as shown in Fig. 5. Slightly decarburized surface reduced the 95,lb. per sq. in. for nonpeened springs to 85,000 to 90,000 lb. per sq. in., whereas on peened springs this ferrite layer was hardened and broken up and resulted in a reduction from 135,000 lb. per sq. in. to 115,000 lb. per sq. in. Zimmerli1 discusses defective wire having seams or hairlines or badly gouged surface and states that shot blasting does not improve the fatigue values, but he does

44-THE IRON AGE, March 29, 1945

not submit data. He concludes that peening is no cure for either defective steel or manufacturing methods, but the data by Lupfert in Fig. 4 appears to be in variance with his findings in that certain surface defects can be rendered unharmful and the fatigue resistance increased by shot peening.

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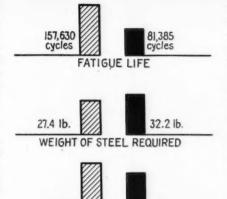
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#### Decarburized and Peened Surfaces

Wiegand10 reported fatigue results on valve springs made of ground wire and on shot peened springs which confirm the favorable effects of this process. The latter showed an increase of 60 per cent in the allowable stress range over that obtained for the ground springs. A mean torsional stress of 75,400 lb. per sq. in. was used in both cases, as calculated at the internal diameter of the spring, but the permissible stress range was 52,600 lb. per sq. in. for the ground springs and 79,700 lb. per sq. in. when peeened. Wire was 0.7 per cent C, 0.5 per cent Mn. and 0.3 per cent Si, and the above endurance values were based on 20 million load cycles.

A good basis exists for the manner in which a decarburized layer obscures the effect of the carbon con-

<sup>o</sup> Decarburized skin approximately 0.002 in. deep.



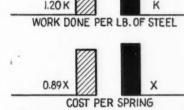


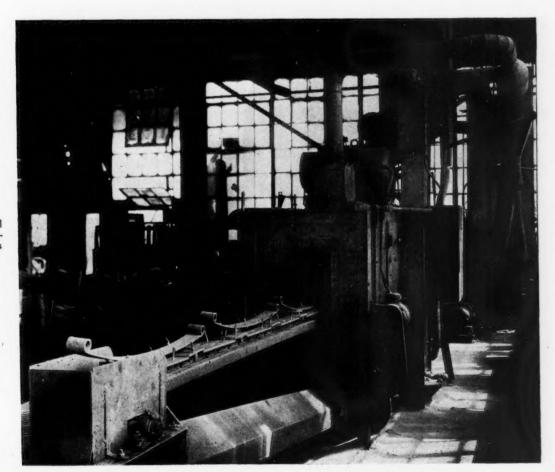
FIG. 11—Comparison data on leaf springs by Eaton. Left shows shot peened grooved section steel. Right shows conventional plain section not peened.

tent on fatigue strength and how it is detrimental to fatigue resistance. Gill and Goodace<sup>27</sup> made detailed and systematic fatigue studies on patented drawn steel wire 0.080 in. in diameter with and without a decarburized surface. The non-decarburized wire was obtained by grinding off the surface decarburized layer before the final drawing operation.

Their results in Fig. 6 show that the fatigue strength in reversed bending was practically independent of the carbon content when a decarburized surface layer was present; the fatigue resistance of the wires was apparently determined by the fatigue strength of the material of lower carbon content in the ferrite skin.

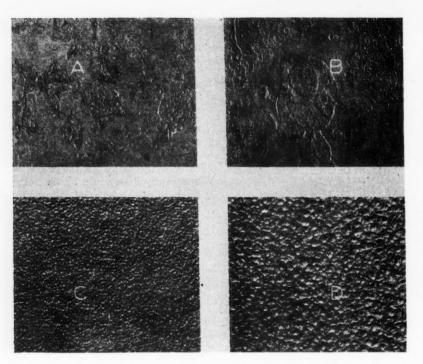
The case of the non-decarburized wire is also shown in Fig. 6 where the improvement in fatigue resistance increases with increasing carbon content. This is in accordance with the usual relationship which exists between carbon content and fatigue resistance. This beneficial influence on fatigue of removing the decarburized layer from members subjected to repeated stresses has been determined by many investigators 10, 25 cm 25 cm 25.

Photomicrographs in Fig. 7 illustrate the structure of the unmachined surface layer on both peened and nonpeened bars of NE 8650 steel forged to 1%-in. diameter and quenched and tempered. Before shot peening, the surface hardness varied between Rc 28-32 on several bars due to variable

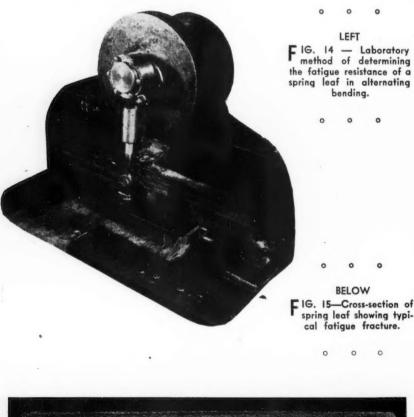


F IG. 12 — Typical peening operations on leaf springs on Wheelabrator.

THE IRON AGE, March 29, 1945-45



F1G. 13—Surface conditions on leaf springs, at five diameters—(a) hot rolled; (b) after heat treatment; (c) same as B after peening with 0.024-in. shot to 0.00702; and (d) same as B after peening with 0.055-in. shot to 0.02202.





decarburized conditions, while about 1/8 in. below the decarburized layer the hardness was Rc 41-43. Structural changes have taken place after peening and Fig. 7 indicates the grain distortion, flattening, and sealing of the grain boundaries on the immediate surface containing the ferrite layer. In this case the rotating bending endurance limit was doubled by shot peening on the unmachined forged surface.

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X-ray measurements by Lessells and Murray<sup>18</sup> indicated the cold worked layer to extend a depth of 0.006 in. on a shot peened surface of SAE 4340 (Brinell 278) which had been previously machined and polished. Almen<sup>5</sup> had previously shown this same depth value by a process of removing the blasted surface skin in successive steps and noting a change in curvature. Zimmerli<sup>1</sup> reported positive microscopic evidence of structural differences at least 0.004 in. deep.

## Sandblasting Effect on Fatigue

Manteuffel<sup>19</sup> published some interesting findings on the beneficial effect of sandblasting quenched and tempered chrome vanadium steel spring wire 0.492-in, in diameter. His results in Figs. 8 and 9 show how the maximum torsional fatigue resistance varies for different surface conditions and tempering temperatures. Curves in Fig. 8 apply to heavy duty springs where the desired spring life does not exceed 500,000 load applications at high stresses; if long spring life is required, then it is apparent that the allowable maximum stresses must be decreased to values given in Fig. 9. These curves are based on the minimum stress being zero.

The spring specimens, which were black after heat treatment and had a decarburized layer, were sand blasted in a special manner with standard quartz blasting sand. Fatigue results in Fig. 8 and 9 produced allowable endurance values for the sand blasted spring stock which was very comparable with the ideal values obtained after grinding off the decarburized layer and then carefully hand polishing with No. 0 paper. While the sand blasting gave the most favorable values at the three tempering temperatures and high hardness values investigated, it would be of more practical interest to have similar data at lower hardness values at which springs are often manufactured'.

Manteuffel explained the above favorable effects of sandblasting in the following manner. The blasting removed the scale layer and the decarburized layer is partially removed and then work hardened; in doing this the surface is supposed to be damaged as

little as possible and provided with favorable compressive residual stresses. Preliminary tests were made concerning different blasting conditions

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t The good results shown by recarburizing were obtained by heating the normally annealed spring material, having scale on the surface, in a durferrite salt bath for two hours, cooled, heated in same bath to hardening temperature, then quenched and given a temper in an air furnace. Increase in fatigue values given here by recarburizing are large compared to the relatively small increases found in similar steel and also silico-manganese spring steel treated in a molten cyanide carburizing bath by Hankins. 30, 31

which showed that less surface damage results with low stream pressure and grain size. It was found expedient to initially use a stream with high pressure in order to rapidly remove the detrimental surface layer and to work harden the surface and provide it with favorable compressive stresses. At the end of the blasting process the surface was smoothed by using a stream with low pressure. In this manner the detrimental influence of the surface damage could be held much lower than the favorable influences even in the case of the high hardness materials.

Frye and Kehl's also investigated the reversed bending fatigue strength of steel wires as it is influenced by various descaling methods using sand, steel shot, and steel grit blasting. Their results in Fig. 10 were obtained on specimens cold-rolled from a heat-

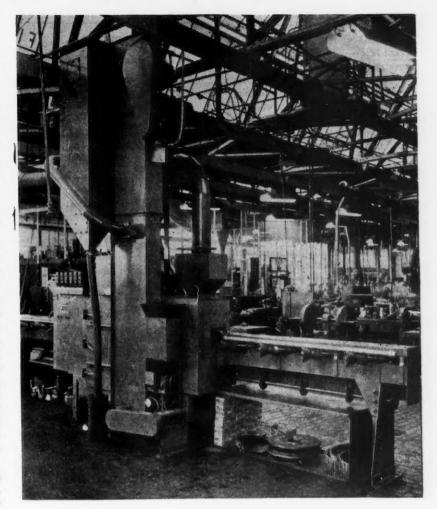
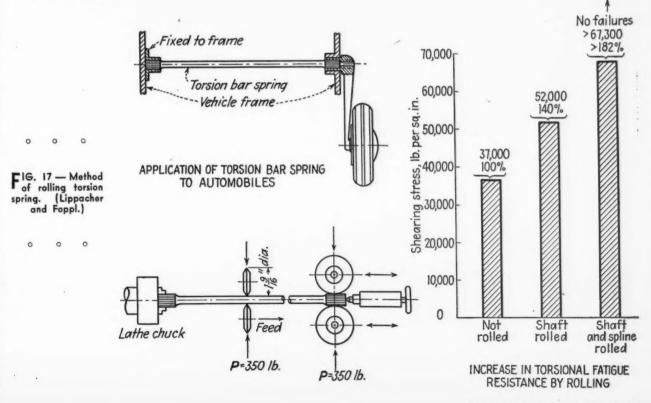


Fig. 16-Method of shot peening torsion bar springs on Wheelabrator.

treated round wire rod to ½ x ½-in. cross-section. No surface decarburiza-

tion was present on the material in the as-tested condition. Sand blasting



with three types of sand decreased the endurance lmit values about 10 per cent below that for the steel in the as-received condition.

The question arises as to why Manteuffel obtained an increase and Frye and Kehl a decrease in endurance values through sandblasting. One plausible explanation is that the hardness values, materials, and surface conditions as to decarburized layer were vastly different in the case of these two investigators. Also the blasting conditions could be different since the intensity and coverage was not specified. Foppl' comments on this question by stating that this disagreement is only an apparent one and is presumably due to the fact that Manteuffel used freshly delivered sand while Frye and Kehl probably used the sand longer, as is usually customary in blasting parts for cleanng operations. He points out that the original sand particles break up into finer particles in a relatively short time. Such fine sand particles exerts only a scratching or cleaning action and its detrimental influence on fatigue resistance is not sufficiently offset by the beneficial effect of cold work of the surface. He concludes that sand can only be used once and to eliminate the constant changing of sand in production it is more expedient to use steel shot.

The engineering and economic utility value of shot peening leaf springs

K Plain carbon steel: 0.54 per cent C, 0.60 per cent Mn, 115,700 lb. per sq. in. ultimate strength, 76,700 lb. per sq. in. yield point, 14.5 per cent elongation, 40 per cent reduction in area, superficial Rockwell N5-71.5. After cold rolling to flat wire it was quenched in molten lead 900 deg. F. and roller straightened.

# TABLE II Life Comparisons for Leaf Springs

Surface Treatment	Vibrations to Failure
Sand blast	50,000 60,000
Shot blast	300,000

has been best stated<sup>22</sup> by Eaton in Fig. 11. Two variables of spring leaf section and shot peening are expressed in this comparison and the separate influence of each is not given. Values shown are based on an accelerated test through an 8 in. stroke, 4 in. above and below normal position and an average of four springs of each type.

It was also claimed<sup>32</sup> by Wallace that greater endurance is obtained if the leaves are peened on the tension side only than if they were peened on both sides. His patent states that the peened spring leaf life is at least 60 per cent greater than when not peened. He explains that the camber or height of the leaf is decreased by shot blasting and this is an indication of the favorable residual compressive stresses on the tension side. This change in camber is provided for by forming the leaf originally to a slightly greater camber.

United States Patents, assigned to German firm of Rochling on the process of shot peening leaf springs, gave life comparison of leaf springs at shown in Table II.

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With still other springs this life improvement was from 100,000 without peening to 1,000,000 vibrations with peening. It was stated that 5 sec. under a sand blast is ordinarily adequate for cleaning and smoothing purposes, but it was found that a minimum of 20 sec. under a shot stream was required for an improvement in fatigue resistance.

Zimmerli<sup>1</sup> reported that Detroit Steel Products obtained 3.46 times the life on shot peened leaf springs as on those not peened. The leaves were peened on the tension side only and were stressed from a minimum of 42,560 lb. per sq. in. to a maximum of 121,050 lb. per sq. in.

Production method of shot peening leaf springs is illustrated in Fig. 12 and it is not unusual to use a conveyor speed of 16 ft. per min. Conveyor speeds about three times as high have been used and while spring performance was improved it has been found that the lower speeds are more effective in increasing fatigue resistance. Typical surface conditions on the surface of 9/16 in. thick leaves at various stages of processing are shown in Fig. 13. Both the hot-rolled and heattreated examples have a decarburized layer and this condition in combina-



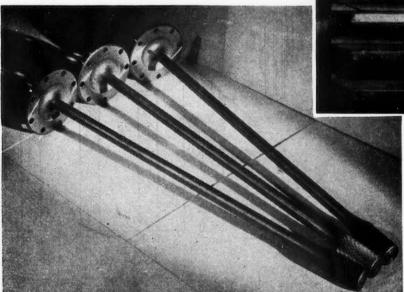


FIG. 19—Typical fatigue fracture at base of tooth on spline.

tion with surface irregularities, hammered-in scale or inclusions is the major cause of the low fatigue resistance of spring steel plates. Various investigations have shown that the inherent bending fatigue resistance of various steels in the ideal machined and polished condition is 1.2 (for mild steels) to four times (for heat treated spring steels) that obtained with such surface skin conditions<sup>19</sup>, <sup>28</sup>, <sup>29</sup>. On high strength forgings, however, this ratio may be as high as 7<sup>31</sup>.

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Surface appearance after shot peening is also shown in Fig. 13 for two different shot sizes. The smaller size shot is generally used. Means of investigating the improved fatigue resistance of single spring leaves by peening is shown in Fig. 14. A typical view of a leaf which has developed a fatigue fracture is indicated in Fig. 15. A small thumbnail area progresses from a point on the surface and then the fatigue crack propagates rapidly to complete fracture.

While this procedure of testing single leaves gives comparative fatigue data on different surface conditions, such data may not be necessarly translated directly into permissible stresses for the design of leaf springs. Constructional influences such as "nip" of the individual leaves, clamping in the band, friction points between the leaves, and presence of eyelets, holes, and stamped notches for leaf alignment all serve to give lower fatigue values for the complete spring

as compared with that for a single leaf. Depending upon the material and hardness, the decrease in the case of complete springs with the as-rolled surface amounted to approximately 30 per cent to 50 per cent; when the spring material is annealed or quenched and then tempered at a high temperature the complete spring is only about 5 per cent to 10 per cent below that for the individual leaf<sup>16</sup>.

### Torsion Springs and Drive Shafts

Greater use is being made in America of the straight cylindrical bar torsion spring for suspension systems than heretofor although it has been in extensive use in Europe for some time. Such torsion bars are generally shot peened to increase fatigue resistance as shown in Fig. 16. The problem and its solution is similar to that already discussed for coil and leaf springs.

Improved fatigue resistance has also been shown for torsion bar springs<sup>h</sup> by Lippacher and Foppl<sup>34</sup> by means of surface rolling both the body portion and the splined ends. The results of their investigation are summarized in Fig. 17. They had considered shot peening but they evidently believed that this operation would interfere with proper engagement of the splined ends which is not considered objectionable in United States. By rolling only the body of the spring, the endurance limit was increased 40 per cent but then fatigue fracture developed in the spline and not in the body as before. The radius at the base of each spline tooth was then rolled at 353 lb. pressure with a roller having a contour radius a little less than the root radius of the spline; the flank angle of the roller was made to clear the sides of the spline and only contact the root radius so as to not interfere with the mating surfaces. When both body and spline was rolled, then no fatigue failure took place even though the alternating torque moments was 1.82 times as great as that for the conventional spring not

Simon<sup>k</sup> shot peens<sup>38</sup> quill drive shafts shown in Fig. 18 as regular production practice. A typical fatigue fracture (CONTINUED ON PAGE 100)

# Aerodynamic Turbine for Blast Furnaces

THE recent introduction of steel recuperators for heating blast-furnace blast in a continuous cycle instead of the intermittent cycle of the brick stove has achieved a considerable reduction in power consumption and has led to smaller heat losses, C. Keller and R. Ruegg report in Stahl und Eisen, 1944, vol. 64, March 30, pp. 201-6.

A promising possibility of further economic improvement is the application of the aerodynamic turbine as the prime mover for blast-furnace blowers. This turbine requires an air heater of similar construction to the and the cycle air which works the turbine; in this the path of the combustion gases is divided into two. The air coming from the blower is heated in the low-temperature section and the cycle air in the high-temperature section. The high pressure employed in the air-turbine plant improves the heat transmission in the high-temperature zone of the air heater. Experience gained with a pilot plant shows that the problem of heating air to high temperatures has been solved. (2) A combination of Cowper stoves and an air-turbine-driven blower. (3) A plant in which the blower compresses the blast to a higher pressure than that required for the furnace; in this the compressed air is heated in the first stage of an air heater and then expanded to about furnace pressure in an air turbine coupled to a blower; the required additional power is produced by an aerodynamic turbine. The expanded air is then heated to the temperature required for the furnace. The advantage of this system is that the heat consumption for an equivalent volume of air is about 6 per cent

It would be advantageous to arrange the plants for these three plans in such a way that the air turbine

lower than with scheme (1).

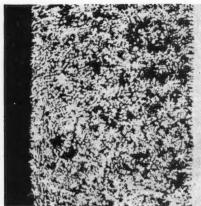
is divided into high- and low-pressure stages, the low-pressure stage driving the blower at 'a rate varying with the required load, and the high-pressure stage driving the compressor for the cycle air. Electric power could also be generated by the air turbine if it were made large enough.

In a combined blast and cycle-air heater capable of heating 220,500 lb. of blast and 240,345 lb. of cycle air per hr. are given, the heating surface for the cycle air is about one-tenth of that for the blast. The cycle-air heater lowers the temperature of the combustion gas to the safe level necessary for the blast-heater tubes. The heating of the cycle air by the combustion gases is carried out in uniflow, which is possible because the temperature gradients between the combustion gases and the air are large and uniflow insures relatively low and evenly distributed tube temperatures. The blast-furnace blast is heated by cross-current flow. An additional burner is fitted between the two stages to provide a means of controlling the blast temperature independently of the cycle-air temperature. When heating the blast in Cowper stoves, thorough cleaning of the blast-furnace gas is necessary, whereas with the new process such careful cleaning becomes unnecessary.

modern steel recuperator.\* The objection that gas turbines require several bulky heat exchangers to achieve a high efficiency is not valid for the air turbine, as the dimensions can be reduced considerably because of the clean working medium and the higher pressure levels employed. The air heater now has the same dimensions as a modern steam boiler of the same output.

Several plans have been outlined:
(1) Where the blower is driven by an air turbine, and a combined air heater heats the blast for the furnace

<sup>\*</sup>See The Iron Age issues of April 16 and April 23, 1942, for detailed data on steel recuperator design.



# PHOTOMICROGRAPH of "tri - alloy" bearing containing 55 per cent cop-

per, 40 per cent lead and 5 per cent

silver. X100, unetched.

UE to the scarcity of cadmium, at the request of the Army Ordnance Department, the Ford Motor Co. has developed a high lead (35 to 40 per cent) copper bearing concaining 4½ to 5 per cent silver. The presence of silver prevents segregation of the lead (see photomicrograph) and resultant fatigue. While

# Copper-Lead-Silver Bearings

# Developed by Ford

more costly than cadmium bearings, it is estimated from tests made in the dynamometer and under actual heavy duty truck engine operations, the new "tri-alloy" bearing will give two to three times the service life of conventional bearings even under the most severe conditions.

The principal advantage of the trialloy bearing is said to be its ability to stand up under heavy load at high speed operation. In road tests on heavy-duty Ford trucks, some bearings and crankshaft journals showed no measurable wear at the end of 50,000 miles of service. In other cases, wear up to 0.0005 in. has been recorded after 40,000 to 50,000 miles of use. In general, the bearing wear factor is about the same for cadmium and tri-alloy bearings, with the crankshaft journal showing a little more wear when the tri-alloy bearing is used, but not enough to be significant. However, resistance to bearing metal fatigue is greatly improved.

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Since existing methods of casting copper-lead bearings were too costly, the next hurdle was to find an economical method of volume production. This was solved by digging out of the archives a technique which had been perfected by Ford ten years ago for casting copper-lead bearings and which had been abandoned with the introduction of the cadmium-coated bearing.

In this process the bearing alloy is deposited on both sides of a low carbon steel backing strip so as to make a double face floating type bearing. While single face copper lead bearings are easy to make, it was in the double coated bearings that lead segregation was most likely to occur, creating weak spots. This is avoided by the introduction of silver, which has also been used in the past in conjunction with cadmium for internal combustion engine bearings.

The steel strip is 2 in. wide and 0.075 in. thick and is fed from coils through pot-type coating furnaces. Control of the thickness of tri-alloy bearing deposit is by means of a pair of graphite dies encased in a cylindrical boot. Molded graphite is used for the dies because it is the only material that will withstand the high temperatures involved (2100 deg. F.) and also provide lubrication for the strip which passes through at the rate of 8 in. per minute. The dies last about 35 hr.

The boot is suspended beneath a pot containing molten alloy and is water cooled at its lower end to freeze the metal on the strip which emerges at

TRI-ALLOY bearing material being poured from one of the electric induction type furnaces operated at the Rouge plant of the Ford Motor Co. The metal is heated to a temperature of 2300 deg. F. The copper and silver are melted first and the lead added just before pouring.



about 200 deg. F. In passing through the molten bath the strip is preheated to prevent alloy freezing on it until it reaches the lower end of the die. Knurled rolls grip the solidified metal and pull the strip vertically down through the pot.

The pictures show the various steps in the process. The three alloying elements are melted in a small induction furnace and the "sweat" furnace is charged periodically. After the coated strip leaves the furnaces, it is sheared to 11 in. lengths, enough for making three truck bearings. These pieces are then run through a chamfering machine to bevel the edges. Forming into bearing halves and machining are done by outside firms.

A careful 24 hr. laboratory check is kept on bonding and on analysis of the mix. A check is made on the alloy on each 8 hr. shift and a bond test is made each half hour on each production unit. Bonding is tested by hammering the strip double and inspecting for adhesion. The company has a battery of ten complete units.

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Percentage of scrap has been greatly reduced since the bearing job was started. The overall rate currently stands at 5 to 7 per cent scrap due to material defects. The scrap rate has been reduced approximately one-third in the past two months on machining operations and Ford is certain of reducing the overall rate to well below 5 per cent. Production currently is around 1/2 million per month.



A CHARGE of tri-alloy bearing metal is poured into a "sweat" furnace in the bear-ing department at the Ford Motor Co. A temperature of 2100 deg. F. is main-tained. Water jacket for the die is visible at the bottom of the furnace.

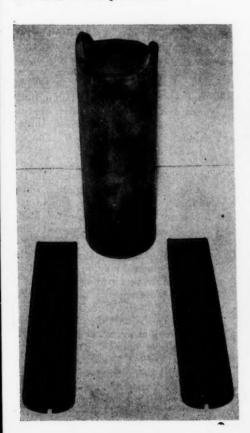


TWO halves of the graphite die through which the steel backing strip passes, picking up a tri - alloy bearing coating on both sides in the proc-The orifices through which the hot metal is introduced are visible at the top of each die; the oil groove on the one at left. The cylindrical object is the booth that holds the die.

RIGHT

A STEEL strip coated on both sides with tri-alloy metal, is shown being pulled through a strip coating machine in the Ford bearing department. The presence of a small percentage of silver prevents segregation and re-sultant fatigue. Thickness of the bearing material averages 0.140 in. and can be controlled in the die.





THE IRON AGE, March 29, 1945-51

# Centerless Grinding Of Screw Threads

. . . Small headless socket screws are being ground on a production basis at a rate of 60 to 70 per min. on the first centerless type grinder developed for thread work. Design and operating principles of this revolutionary type of machine, which employs a crushed rib wheel, are described by the author.

EVELOP-MENT of a centerless thread grinder makes it possible to grind 4-20 By MORRIS GJESDAHL
Research Engineer, Landis Tool Co.
Waynesboro, Pa.

in. diameter, 16 pitch have been ground in two passes. Screws 12 in. long, ¼ in. diameter, 20 pitch

headless socket screws from solid hardened blanks at the rate of 60 to 70 per min. in a single pass through the machine, a decided increase in production rate over the present method of cutting threads on this type of screw. Set screws ranging in size from No. 4-40 pitch up to  $\frac{5}{2}$  in.-11 pitch have been ground in production on a new unit just announced by the

Landis Tool Co., Waynesboro, Pa. Ex-

perimentally, hardened steel rings 5

have been ground with excellent results.

The idea of grinding screw threads on a centerless grinding machine was first suggested on Feb. 24, 1943, by M. A. Hollengreen, vice-president and general manager of Landis Tool Co. He also proposed forming the required grooves on the grinding wheel by means of crushing, using cylindrical crushers with annular grooves. In the development of the Landis Tool cen-

terless grinder, Fig. 1, the essential elements of the Landis No. 12 centerless grinder (THE IRON AGE, May 11, 1944) are utilized, but many more adjustments are provided for the regulating wheel and the position of the work rest is different.

As shown in Fig. 2, at A, the grinding wheel base may be moved laterally to increase or decrease the throat between the grinding wheel and regulating wheel. Movements of the grinding wheel base as small as 0.0001 in. may be made by means of the handwheel. The regulating wheel and its base is universal in its movements as shown by the arrows in Fig 2. It also can be moved laterally as shown at A to increase or decrease the throat and be located as required for various diameters of work with respect to the stationary work rest. It can be adjusted forward or backward as shown at B and in addition has a hydraulic traverse movement in this direction for the diamond dressing of the regulating wheel on the exact line of contact of the work. The diamond is fixed on the work rest. A swivel plate permits rotation of the regulating wheel base to adjust the regulating wheel parallel to the grinding wheel or at an angle if taper work is to be ground. Probably the most important adjustment and the one most often used on the Landis Tool centerless thread grinder is that shown at B. The entire regulating wheel base may be tilted to the required angle to provide the feeding action through the throat between the grinding wheel and the regulating wheel. The adjusting screw is graduated so the angle may be adjusted to the nearest min-

The feeding through action of the regulating wheel may be explained by means of a vector diagram, Fig. 3. Let  $V_r$  represent the peripheral velocity of the point O of the regulating wheel. This equals the circumference of the regulating wheel times the revolutions per minute. The angle a is the tilt angle. Then the vector  $V_{\omega}$  represents the axial speed of the work across the face of the regulating wheel and is equal to the velocity  $V_r$  times a. The vector  $V_{\sigma}$  represents the

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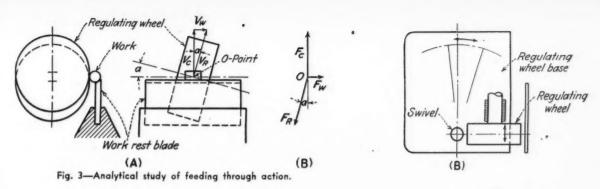
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FIG. I—Landis Tool centerless thread grinder brings production of ground threads within range of thread rolling practice.





peripheral velocity of the point O of the work piece. The velocit  $V_c$  is equal to the velocity  $V_r$  times cost a. A resolution of forces is shown at B. Here the tangential braking force  $F_r$  of the point O on the regulating wheel is the resultant of the forces  $F_c$  and  $F_w$ .  $F_c$  represents the tangential force at the point O on the surface of the work and  $F_w$  represents the force producing axial movements of the work.

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An appreciation of the preceding analytical study is essential to the application of the centerless grinding machine to the grinding of screw threads. The angle a in Fig. 3 represents the helix angle for the screw thread being ground, and is shown as the angle between the path of the center of the screw and the axis of the regulating wheel spindle.

# Centerless Grinder Modified

The adaptation of the Landis No. 12 centerless grinder to thread grinding involved several changes in its design. First, a crusher dresser attachment has been built into the grinding wheel base with a separate motor drive for this unit. This is in addition to the standard hydraulically operated diamond dresser for the grinding wheel. Second, an auxiliary speed reduction has been provided for the regulating wheel so that its rotative speed can be further reduced. Third, a new type work rest has been designed to meet the special requirements for thread grinding. Fourth, the electrical controls have been engineered to provide flexibility of operation.

The crusher is driven through a worm gear reduction by a constant speed motor and is fed into the grinding wheel face by a graduated handwheel. The crusher is cylindrical in form and is readily replaced. (See Fig. 4). Provision is made in the grinding of the crusher profile that all crushers made for a given pitch are interchangeable so that alinement with the form on the wheel is assured. Driving the crusher during the crushing operation instead of the grinding wheel offers an advantage which per-

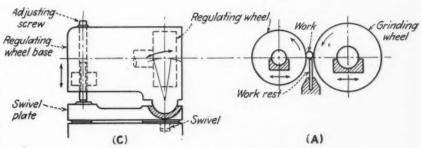


Fig. 2-Adjustments of grinding wheel base and regulating wheel base.

mits regrinding to renew the form on a worn crusher. A substantial saving in crushers is realized.

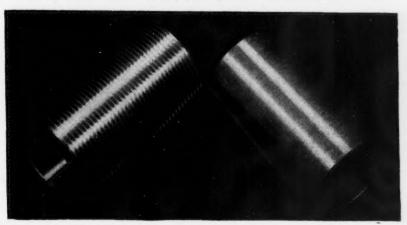
The auxiliary speed reduction for the regulating wheel and a clutch arrangement permits changing from the standard speed range of 12 to 96 r.p.m. to a low speed range of 2 to 16 r.p.m. The same rheostat can be used to obtain the desired speed in either range.

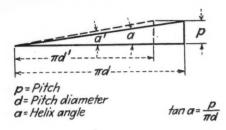
The work rest requirements in centerless thread grinding are different from those of ordinary centerless grinding. Because of inherent design features, the throat or opening through which the screw stock passes is variable on the No. 12 machine. The work rest for the centerless thread grinder, on the other hand, provides side blades which move parallel to each other, so that the screw stock has a constant width throat through which to pass no matter what the slope angle of the blade is. In addition the time re-

quired to change the setup from one screw size and pitch to another has been materially reduced by the provision of wedges ground to the proper tilt angle for each pitch and diameter of screw.

One drum type switch having five stations is used for control of the machine. These stations are: Setup, where only the hydraulic pressure oil pump is in operation; grind, where the grinding wheel, regulating wheel and coolant pump are in operation; dress, where the grinding wheel is in operation, the regulating wheel is running at dressing speed of 300 r.p.m., the coolant pump and the hydraulic pressure pump are running; crush, where only the crusher drive motor and the coolant pump are running; regrind, where the crusher drive motor, the grinding wheel motor and the coolant pump are running. Interlocking is provided in this drum switch in-

Fig. 4—Crushers used for forming grinding wheel. The grooves are annular.



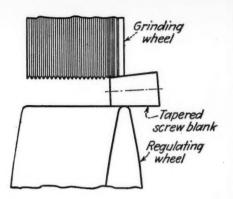


suring safety of operation in moving from one station to another.

Crusher life is a function of the speed of dressing. Crusher wear or deterioration of form is due to the honing action of the grinding wheel grit. Therefore the higher the surface speed of the crusher the more rapid and severe the honing action will be. The experience gained thus far indicates that a crusher surface speed of approximately 150 ft. per min. in crushing a 4 in. wide grinding wheel is satisfactory. In general it takes about 1 min. of crushing to remove 0.001 in. from the radius of the grinding wheel. Thus, if 0.004 in. of the radius must be removed from the groove form on the face of the wheel, the time required will be approximately 4 min. Usually an extra minute is allowed during which time the crusher is not fed further against the wheel. This "drifting" of the grinding wheel permits a sharpening of the groove form on the grinding wheel face as the pressure due to crushing is gradually relieved. In grinding some sizes of screws it has been possible to grind for a day or more before recrushing the wheel to renew the form. The total time required to recrush the wheel is about 10 to 12 min.

The diamond dresser is used for truing before any grooves are crushed into the grinding wheel and also for dressing the chamfer or "throat" at the entrance edge after the grooves have been crushed. Chamfering of LEFT FIG. 5—Method of determining helix angle.

RIGHT
FIG. 6—Tapered hardened screw blank with
small diameter entering
throat.



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the wheel is done for two purposes: First, to centerless grind the o. d. of the blanks before threading begins; second, to gradually form the threads so that the metal removal is distributed across the face of the wheel and the full depth grooves remain to clean and true the thread form of the screw as it leaves the grinding wheel.

## Modification of Helix Angle

In order for the screw to thread its way through the throat between the grinding wheel and the regulating wheel it is essential that the path of the screw have the proper relation with respect to the grinding wheel axis and to the regulating wheel axis. The grinding wheel axis must be at the helix angle with respect to the path of the screw.

Grinding to a pitch diameter different from the basic pitch diameter changes the helix angle. As shown in Fig. 5 the tangent of the helix angle a is equal to the pitch distance p divided by the circumference of the pitch diameter circle  $(^{\pi}d)$ . Decreasing the pitch diameter reduces the pitch circle circumference to  $(^{\pi}d')$ . With no change in the pitch distance, the helix angle is increased from a to a'. Since the pitch of the thread is constant and dependent upon the spacing of ridges on the grinding wheel, it has been found

that the setup requirements involving the helix angle are critical. An example will illustrate this point. The table of standards for class 3 fit of screw threads gives the following values for ¼ in., 20 pitch:

			Basic	Min. Values
Major	diameter,	in.	 0.2500	0.2428
Pitch	diameter,	in.	 0.2175	0.2139
Helix	angle		 4° 11'	4° 15'

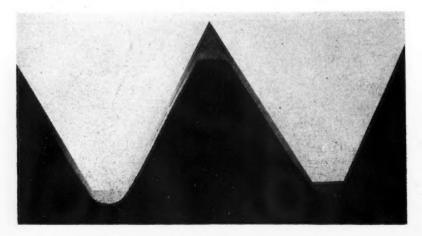
Suppose the screw blanks to be ground are less than 0.250 in. say 0.248 in., then in order to centerless grind the o. d. some dimension must be selected and for this example 0.246 in, shall be used. The pitch diameter of the screw is to be 0.216 in. which is a little above the average pitch diameter for a class 3 fit. For this pitch diameter the corresponding helix angle is 4 deg. 13 min. The slope of the top of the work rest blade with respect to the centerline of the grinding wheel spindle will be increased about 0.003 in. in a length of 5 in., that is, 0.003 in. more than what would be the slope for the helix angle of 4 deg. 11 min. for the basic pitch diameter. This consideration of the change in the helix angle due to grinding below the basic pitch diameter is critical in the smaller diameters, specifically those under % in.

Once a pitch diameter has been selected, such as 0.216 in. for ¼—20 screws, it is possible to maintain this value consistently within a tolerance of 0.0005 in. as long as the groove form will pass inspection for a class 3 fit.

With grinding wheel to the right of the screw and its axis horizontal, the top of the work rest blade must slope downward toward the rear of the machine at the helix angle. Likewise the regulating wheel which has no grooves on its face must assist in rolling the screw through the machine. Its axis must be tilted downward at the helix angle with respect to the top of the work\*rest blade so that its angle with respect to the grinding wheel axis is double the helix angle.

In setting up the centerless thread grinder the height of the centerline

Fig. 7—Comparator picture of ground screw thread form magnified 50 times.



of the screw is first located in accordance with data furnished for each size of screw. Adjustment of this height is made by moving the wedge under the blade forward or back. The regulating wheel is then dressed on the line of contact, obtained by sliding a screw blank on the stationary regulating wheel surface, after which the regulating wheel base is tilted to double the helix angle. The side blades, first on the regulating wheel side and then on the grinding wheel side are finally adjusted as for any other centerless grinding, allowing clearance so screw blanks do not touch these blades.

The grinding wheel is brought in when not rotating until contact against the screw blank makes sliding along the blade difficult. The wheel is then rotated and fed in by handwheel to give the required depth of grind. After a sample or two have been ground and the wheel base properly adjusted for depth of thread, the screw blanks may be fed to the machine either manually or by means of an automatic loader.

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The relationship between the major diameter of the screw being ground on the centerless thread grinder and the pitch diameter is constant. This is true if the screw blank is ground on the major diameter throughout its length while the screw thread is being formed. The reason for this constant relationship is that the outside of the screw rides on the regulating wheel and the depth of cut by the grooves in the grinding wheel is controlled by the diameter of the blank. The action may be better understood by reference to Fig. 6, which shows a tapered blank with the small diameter entering the throat. Since the major diameter is not ground on the small end of the blank, the grinding wheel grooves will not cut full depth, but as the large end goes through, the major

diameter is ground and the thread depth is complete. Therefore, the leading end of the screw will have a larger pitch diameter than the trailing end.

Another factor which applies in this constant relationship of the major diameter and pitch diameter is due to the groove form on the crusher. Except for the fact that the grooves on the crusher are annular (that is, do not form a helix) and the groove on the screw is a helix, the depth of the groove form and the width of top flat and width of bottom flat will be almost identical. As long as the grinding wheel grooves remain the same and show no signs of wear the screw as it leaves the throat between the two wheels will be constant in major diameter and pitch diameter, provided the blank is of constant diameter to begin with or providing the major diameter is ground on the screw throughout its length.

As the wheel gradually wears away on the tops of its ridges, the depth of the thread decreases. When the minor diameter no longer passes the gage, the wheel must be recrushed. During the grinding of many screws, the thread riding on the regulating wheel surface tends to crush shallow grooves in the regulating wheel, causing the major and pitch diameters to increase. This crushing or grooving of the rubber bonded regulating wheel is very gradual and may be compensated by moving the grinding wheel toward the regulating wheel 0.0002 to 0.0003 in. When this adjustment has been made it is only necessary to check the major diameter of the screws because they will be the same on the pitch diameter as those ground initially. When the depth of the grooves in the regulating wheel becomes too great, the wheel is dressed smooth again. Dressing is necessary about once a day.

In grinding headless socket set screws, say of ¼-in. diameter with

cup point, it does not matter which end enters the machine first, nor does it matter if all the blanks line up with cup point first. Therefore, an automatic loader which will feed the blanks in line into the machine permits an operator to spend his time checking an occasional screw from one or more machines. Checking the form on a visual shadow gage or a ring gage will indicate whether the grinding wheel should be moved in a little or whether the form should be renewed by crushing.

A loader of the vibration type has been developed at the Landis Tool Co. which can automatically feed ¼ in. diameter by ½ in. long screw blanks at a rate as high as 85 per min. It is only necessary that the operator keep the hopper filled.

#### **Production Data**

During the period the experimental centerless thread grinder has been in operation it has been grinding threads on commercial socket set screws varying in size from No. 4—40 pitch to %—11 pitch from a hardened solid screw blank in one pass through the machine.

It has been found that an economical rate of grinding 1/4-20 screws is about 30 to 35 in. of length per min. This means that if the blanks are 1/2 in. in length the quantity rate is 60 to 70 per min. It has been possible on many occasions in grinding 1/4 in. screws to operate continuously for 8 hr. without recrushing the form on the wheel. During this time from 12,-000 to 16,000 screws of the 1/2 in.length will have been ground. Checking screws while the machine operates eliminates any further necessity of inspection. The only difference between the first and last screws is in the minor diameter. Initially the root of the thread would have had a narrow width and a minor diameter near the

(CONTINUED ON PAGE 106)

# Properties of Thorium-Bearing Heat-Treatable Steels

THE effect of additions of thorium to three low-alloy steels (alloyed with vanadium, chromium and molybdenum, respectively) and one plain carbon steel, all containing about 0.3 per cent carbon and about 1.8 per cent manganese is described by H. Cornelius in Archiv fur das Eisenhuettenwesen, vol. 17, July to August, pp. 23 to 27.

The effect of adding up to 1.4 per

cent thorium to heat-treatable steels is governed primarily by the formation of the exceedingly stable carbide ThC<sub>2</sub>, which is practically insoluble in solid iron at temperatures up to 2444 deg. F. In spite of this, the hardening temperature range is only extended a little. The effect of the insolubility of thorium carbide in solid iron is that the steel loses its heat-treatability entirely if the thorium content

amounts to about 10 times the carbon content and is sufficient to convert all the carbon into thorium carbide. The presence of large amounts of thorium carbide in heat-treated steel also reduces its toughness. The scaling resistance of steels at 1202 deg. and 1472 deg. F. was not improved by the addition of thorium. If addition exceeds a few tenths of 1 per cent, the effect is liable to be detrimental.

# Nitrogen In **Chrome-Nickel Steels**

. . . Shown here are the improvements in mechanical and electrical properties resulting from a partial substitution of nitrogen for nickel in austenitic and austenitic-ferritic chrome-nickel steels. This is a translation by C. M. Cosman of an article in Stahl und Eisen, by R. Scherer, G. Riedrich and H. H. Kessner.

RON and steel generally contain very little nitrogen, but chromium and chromium alloys contain considerable amounts of this element. As long ago as 1926, F. Adcock1 brought this point to general attention. He also observed that nitrogen causes certain changes in the microstructure of low-carbon steels with 17.5 per cent and 24.5 per cent chromium. Adcock noted islands of a martensitic or pearlitic character

after quenching these steels from 1250 deg. and 1220 deg. C. (2282 deg. and 2228 deg. F.) respectively. Between 1934 and 1935 V. N. Krivobok<sup>2</sup> suggested that this condition is caused by a shift in the boundaries of the gamma phase to higher chromium contents, and in this respect nitrogen would act like carbon. In the years 1933-35 R. Franks' showed that nitrogen causes a grain refinement in ferritic-chrome steels in the as-cast condition, that it produces a considerable reduction in grain growth after hot working, when held at elevated temperatures and that it causes an increase in the yield limit of austenitic 18-8 steel.

G. Riedrich' demonstrated in 1940 on non-magnetic structural steels with 17 to 18 per cent manganese that nitrogen produces an increase in the yield limit of austenitic-manganese-chrome steels which corresponds in magnitude to that achieved in the austenitic 18-8 steel, and that nitrogen exerts a stabilizing influence on austenite. In the same year R. Scherer pointed out that nitrogen improves the deep-drawing properties of 18-8 steel and showed that in highly alloyed chrome-nickel steels 0.10 per cent nitrogen can replace 3 to 4 per cent nickel. At about the same time W. Tofaute and H. Schottkys confirmed this contention on steels with about 23 per cent chromium. Already in 1939 F. Rapatz suggested in a secret session of the conference on alloyed steels that nitrogen might replace nickel to some extent in the manufacture of austenitic stainless steels.

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Fig. 1 shows the influence of increasing nitrogen contents on the yield limit (0.20 per cent) of austenitic 18-8 steels. Stainless steel to which no nitrogen had been intentionally added, contained 0.015 per cent nitrogen and had a yield limit of 21.4 kg. per sq. mm. (30,540 lb. per sq. in.). Up to a nitrogen content of 0.04 per cent the yield limit remained unchanged, when the steel contained 0.07 per cent nitrogen it rose to 24.2 and at 0.11 per cent nitrogen reached 29.1 kg. per sq. mm. (34,420 and 41,390 lb. per sq. in.). Further nitrogen additions do not influence this value to any considerable extent. Therefore, in order to reach the maximum yield limit, 18-8 steels require 0.10 to 0.12 per cent nitrogen.

Also, in austenitic-ferritic chromenickel steels the yield limit is raised by nitrogen to a similar extent. Thus, an austenitic-ferritic steel containing 60 per cent austenite and 40 per cent ferrite (steel No. 4, Table I), had a yield limit of 43.6 kg. per sq. mm. (60,590 lb. per sq. in.) without nitrogen. (This value which is considerably higher than that obtained with an 18-8 steel must be attributed to the 40 per cent ferrite content.") An austenitic-ferritic steel with a similar austenite and ferrite content bearing 0.14 nitrogen (steel No. 5, Table I) has a yield limit of 52.7 kg. per sq. mm. (75,000 lb. per sq. in.). Also, these austenitic-ferritic steels do not experience a further improvement in

<sup>1</sup> J. Iron and Steel Inst., 114 (1926) p. 117/26. <sup>2</sup> Metal Progress, 26 (1934), No. 5, p.

21/25. THE IRON AGE, 132 (1933), No. 10, p.

Stahl und Eisen, 60, (1940), p. 815/18. <sup>6</sup> Chem. Fabrik, 13 (1940), p. 373/79. <sup>6</sup> Arch. Eisenhütt., 19 (1940/41), p.

71/76. Arch. Eisenhütt., 13 (1939/40), p. 53/57.

# TABLE I

Yield Limit [0.2%] of Ausenitic and Austenitic-Ferritic Chrome-Nickel Steels, and Austenitic Manganese-Chrome Steels With and Without Nitrogen, After Quenching in Water from 1920 Deg. F.

							Yield	STRUC	TURE	
Steel No.	steel Per Per Per Per Per Li	Limit Lb. Per Sq. In.	Austenite Per Cent	Ferrite Per Cen						
1	0.08	0.31	0.59	17.37	8.82		30,000	100	0	
2	0.11	0.48	0.42	18.03	8.61	0.13	41,500	100	Õ	
3	0.10	0.37	0.48	17.68	8.52	0.17	42,000	100	0	
2 3 4 5 6 7	0.10	0.53	0.55	25.44	8.45		62,000	60	40	
5	0.13	0.54	0.68	25.26	4.96	0.14	75,000	60	40	
6	0.11	0.52	0.48	25.96	3.49	0.29	77,000	60	40	
	0.12	0.68	0.75	26.26	3.32		69,000	20	80	
8	0.14	0.73	0.61	25.36	1.41	0.15	66,000	20	80	
	0.34	0.32	17.93	5.81	1.77		35,000	100	0	
10	0.32	0.44	18.03	6.72	2.04	0.09	51,000	100	0	
11	0.15	0.82	7.78	14.44	1.52		36,000	100	0	
12	0.16	0.68	7.93	14.96	1.42	0.11	51,500	100	0	

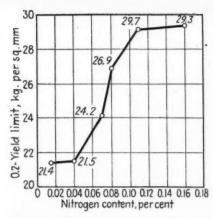


FIG. I—Influence of nitrogen on the yield limit of 18-8 steel.

28 24 cent 20 Austenite 16 per Nickel content, Austenite 12 martensite Austenite 8 ferrite Vartensite troostosorbite martensite-ferrite 4 Martensite-ferrite 10 14 16 18 Chrome content, per cent

Fig. 2-Structure diagram of chrome-nickel steels.

the yield limit by further nitrogen addition, as shown by a chrome-nickel steel with 0.29 per cent nitrogen, 60 per cent austenite and 40 per cent ferrite (steel No. 6, Table I).

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In austenitic-ferritic chrome-nickel steels with austentite contents below 40 per cent, the yield limit is not increased by nitrogen. The nitrogen bearing austenitic-ferritic chromenickel-steel (steel No. 8, Table I) with 20 per cent austenite and 80 per cent ferrite has practically the same yield limit as the austenitic-ferritic chrome-nickel steel (No. 7, Table I) of similar structural composition The other mewithout nitrogen. chanical properties are not influenced by nitrogen to any considerable extent, the microstructure being constant.

The austenitic-manganese-chrome steels experience very similar increases in the yield limit (steels Nos. 9 to 12. Table I).

As pointed out in the introduction, nitrogen expands the gamma phase in chrome-bearing steels towards higher chromium contents similar to carbon<sup>2</sup>. This effect has also been observed in highly alloyed chromenickel steels, so that in the phase diagram the boundaries of the austenitic-ferritic area are shifted towards higher nickel contents by increasing the nitrogen in the steel.

In Fig. 2 the phase diagram of chrome-nickel steels shows the constitution of austenitic-ferritic steels with 0.10 per cent carbon. It will be seen that an 18 per cent chrome steel with about 7 per cent nickel lies just above the austenite-ferrite or austenite-martensite-ferrite area, that a 20 per cent chrome steel must contain at least 9.5 per cent nickel in order to be purely austenitic, and a 25 per cent chrome steel requires at least 18 per cent nickel. In order to keep a 20 per cent chrome steel in the austenite-ferrite area about

5.5 per cent nickel are required and 4 per cent nickel for a 25 per cent chrome steel.

Fig. 3 shows the austenite-ferrite phase of chrome-nickel steels with about 0.10 per cent carbon which contain about 0.15 per cent and 0.25 per cent nitrogen additionally. Details are given in Table II, and for greater simplicity only chrome-nickel steels with about 0.15 per cent nitrogen have been entered in Fig. 3. Furthermore, the boundaries of the austenite-ferrite area of chrome-nickel steels without nitrogen have been entered in thin lines. The 18 to 20 per cent chrome corner of the austenite-ferrite phase with about 0.25 per cent nitrogen is dotted, since chrome-nickel steels with less than 20 per cent chrome and a nitrogen content of 0.25 per cent can be manufactured only with difficulty. From this diagram it is clear that nitrogen has the effect of shifting the boundaries of the austeniteferrite area towards lower nickel contents, and the quantity of nickel replaced by nitrogen on the basis of microstructure is clearly seen. The following table summarizes the conclusions reached:

Therefore, depending on the amount of chrome contained, 0.15 per cent nitrogen can replace 2 to 4 per cent nickel, and 0.25 per cent nitrogen 2.5 to 6 per cent nickel.

For corrosion resistant materials both austenitic and austenitic-ferritic chrome-nickel steels are important, up to 20 per cent ferrite. Such ferritic steels are almost equal to the purely austenitic ones in respect to toughness. Austenitic-ferritic chromenickel steels with 10 to 20 per cent ferrite are more resistant against intergranular corrosion than purely austenitic steels and can be made completely stable by suitable heat treatment'. The same is true for nitrogen - bearing austenitic - ferritic chrome-nickel steels. As Table II shows, austenitic - ferritic chromenickel steels preserve their good mechanical properties up to 30 per cent ferrite.

For corrosion resistant applications, therefore, austenitic and austenitic-ferritic chrome-nickel-nitrogen steels with 0.10 per cent carbon, 20 to 25 per cent chrome, 4 to 4.5 per cent nickel and 0.20 per cent nitrogen can be used. These steels have good

	trogen Replaces Nickel	,	
Per Cent Nitrogen	in (Per Cent) Chrome Steel	Needs (Per Cent) Nickel	to become
0.15 0.15 0.15 0.25 0.25 0.15	18 20 25 20 25 20 25 20	5.5 6.5 14.0 5.5 12.0 2.5 1.0	austenitic purely austenitic purely austenitic purely austenitic purely austenitic austenitic-ferritic austenitic-rerritic

	Typical Data Taken From Table II								
Steel No.	With (Per Cent) Ferrite	Has (Per Cent) Elongation	And Impact (Ft-Lb. Per Sq. Cm.) Strength						
19 28	30 20	42.6 34	147.6 134.5						
41	30	34 30	118.6						

ghness and chemical alline stability.

ty of the austenite imthe action of nitrogen the austenitic chrome-nickel and on the austenitic-mangathrome steels.

is well known that the austenitic 5-8 steel does not remain austenitic after cold deformation, but changes increasingly into martensite. Thus8 the magnetic saturation increases from about 500 gauss in the undeformed condition to 1300 gauss after 20 per cent and 7000 gauss after 60 per cent cold deformation. In the 18-8 steel containing 0.15 per cent nitrogen no noticeable increase occurs in the magnetic saturation during a similar degree of cold deformation (Fig. 4). In the nitrogen bearing 18-8 steel, therefore, practically no austenite is transformed into martensite by cold deformation, which again can be explained by the increased stability of the austenite in nitrogen bearing chrome-nickel steels.

The faculty of work-hardening cold deformation is, however, not impaired by the austenite-stabilizing action of nitrogen. For, the tensile strength of the nitrogen bearing 18-8 steel increases by cold work almost as much in the nitrogen-free as in the nitrogen-bearing steel. The same is true for austenitic-chrome-manganese steel.

Therefore, alloying of stainless steels with nitrogen offers materials which combine high tensile strength

- Austenite-ferrite area without nitrogen Austenite-ferrite area with 0.15% N2 Austenite-ferrite area with 0.25% N2 Austenite chromenickel-steel With Austenite-ferrite about chrome-nickel steel 0.15% No Martensite or martensite ferrite chrome-nickel-steel 18 812 50 10 content, 0 20 21 Chrome content, per cent

FIG. 3—Shift in the austenite-ferrite areas in the phase diagram of chromenickel steels by the addition of 0.15 and 0.25 per cent N<sub>2</sub>.

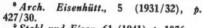
(256,000 to 285,000 lb. per sq. in.) with absence of magnetism.

The austenite-stabilizing action of nitrogen is favorable, furthermore, in all cold-deformation processes, especially in the manufacture of deep drawn parts. Here, deep-drawing properties were determined by the wedge deep-drawing tests (Keilzug-Tiefungsverfahren<sup>10</sup>) which was found very satisfactory. Tests show that the nitrogen content of 0.15 per cent produces the same deep-draw-

ing properties on an 18-8 steel as the more highly alloyed steels. Hence it appears that the deep-drawing properties of 18-8 steel can be improved considerably by the addition of nitrogen. These test results have been fully borne out by practical experience.

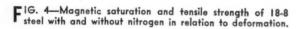
Nitrogen bearing austenitic and austenitic-ferritic chrome-nickel steels are rust and corrosion resistant and also heat resistant. Therefore, their tendency to embrittle after annealing at elevated temperatures must be investigated. W. Tofaute and H. Schottky' showed that a nitrogen bearing chrome-nickel steel with 0.06 per cent carbon, 22.5 per cent chrome, 4.13 per cent nickel and 0.29 per cent nitrogen embrittles most pronouncedly after extended exposure to a temperature of 930 deg. F. The austenitic 18-8 steel experiences the most drastic loss in toughness after annealing at 1470 deg. F.11. This difference in behavior is not attributable to the nitrogen content, as shown by test results obtained with chromenickel-nitrogen steels with about 20 to 25 per cent chrome, after long term annealing at 390 to 1650 deg. F. (Figs. 6 and 7).

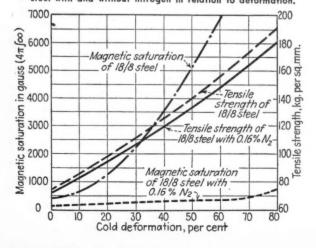
In Figs. 5 and 6 the embrittlement of austenitic chrome-nickel-nitrogen steels (Nos. 23, 32, Table II) after a 100-hr. anneal at temperatures between 390 and 1650 deg. F. is most pronounced at 1470 deg. F. Therefore, purely austenitic nitrogen-bearing chrome-nickel steels behave similar to the chrome-nickel steels without nitrogen, in respect to embrittlement after long term annealing at elevated temperatures. Whether the tendency towards embrittlement



<sup>&</sup>lt;sup>o</sup> Stahl und Eisen, 61 (1941) p. 1076. <sup>10</sup> Stahl und Eisen, 54 (1934), p. 993/98. Mitt. Komge-U. Eisenforsch., 2, (1939), p. 141/55.

<sup>&</sup>lt;sup>11</sup> F. Anorg. Allg. Chemie, 188 (1930), p. 309/24.





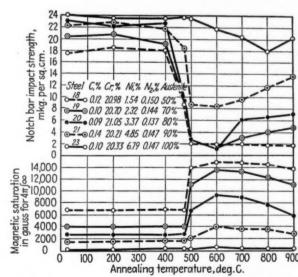
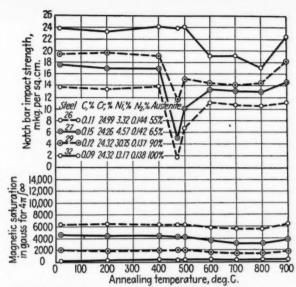


FIG. 5—Notch bar impact strength and magnetic saturation, after 100-hr. anneal at 200 deg. to 900 deg. C., for steels with about 20 per cent Cr, 0.15 per cent № and 1.5 to 7 per cent №. Steels previously water quenched from 1100 deg. C.



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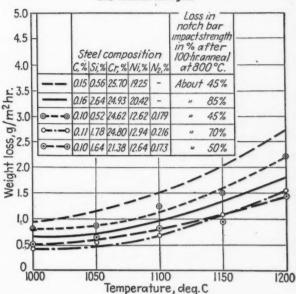
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FIG. 6—Notch bar impact strength and magnetic satura-tion at 200 deg. to 900 deg. C., for steels with about 25 per cent Cr, 0.15 per cent N<sub>2</sub> and 3 to 13 per cent Ni. Steels previously quenched in water from 1100 deg. C.

FIG. 7—Scale resistance of austenitic Cr-Ni steels with and without nitrogen.



in austenitic chrome-nickel steels is enhanced by the presence of nitrogen or reduced12 will require still further tests.

Austenitic - ferritic chrome - nickel steels exhibit a tendency towards embrittlement which is distinct from the basis of magnetic saturation de-After a 100-hr. anneal at temperatures up to 750 deg. F. no reduction in Izod values is observed, just as in the austenitic chrome-nickel-nitrogen steels. After a 100-hr. anneal above that temperature, however, the notch bar impact strength decreases considerably.

In the austenitic-ferritic steels Nos. 18, 19, 20, 21 (Table II) a minimum value for the notch bar impact strength is obtained after a 100-hr. anneal at 930 to 1110 deg. F. (Fig. 5). After a 100-hr. anneal above 1110 deg. F. the notch bar impact strength increases again with the exception of steel No. 18, which has the lowest nickel content.

The difference between purely austenitic and austenitic-ferritic chromenickel-nitrogen steels Nos. 18 to 21 in respect to embrittlement resides in the tendency of the ferrite to embrittle at 750 to 930 deg. F. and in the instability of the austenite after a 100-hr. anneal at 930 to 1650 deg. F., owing to the low nickel content.

This difference was established on the basis of magnetic saturation determination. The decrease in impact strength of these steels after annealing at temperatures above 750 deg. F. is caused largely by the 750 to 930 deg. F. embrittlement range, e.g. at 882 deg. F. annealing causes no change in the magnetic saturation. It is well known that the 750 to 930 deg. F. embrittlement range of ferriticchrome steels does not influence the magnetic saturation13. At 930 deg. F. further embrittlement is caused by an additional factor, which reduces Izod values still further. Actually the impact strength should increase again at 930 deg. F., since the tendency of the ferrite to embrittle is lower at that temperature than at 882 deg. F.13. The more pronounced decrease in the impact strength after a long term anneal at 930 deg. F. must, therefore, be attributed to a partial transformation of the austenite into martensite, because the magnetic saturation increases considerably, and more strongly the lower the nickel content.

A 100-hr. anneal at 1110 deg. F. compared with that at 930 deg. F. leaves the notch bar impact strength practically unchanged although magnetic saturation measurements would point to a stronger decomposition of the austenite. This effect is explained by the decreasing influence of the 750 to 930 deg. F. embrittlement range. Both the notch bar impact strength and the magnetic saturation of steel No. 18 with the lowest nickel content are unchanged after a 100-hr, anneal at temperatures above 1110 deg. F. and in the three steels with higher

nickel contents. The Izod values increase after annealing for 100-hr. at temperatures above 1110 deg. F. While the magnetic saturation curves decrease, the higher notch bar impact strength after long-term annealing at temperatures above 1110 deg. F. must be due to an incinient decrease in the austenite-martensite transformation. However, the magnetic saturation of purely austenitic chrome-nickel-nitrogen steels Nos. 23 and 32 remain unchanged after annealing for 100-hr. at elevated temperatures (1110 to 1650 deg. F.). An explanation for this effect cannot be offered at this time.

The three austenitic-ferritic chromenickel-nitrogen steels containing about 25 per cent chrome, Nos. 25, 27 and 29 (Table II) show the strongest embrittlement after extended annealing at 882 deg. F. (Fig. 6) which is the more considerable the greater the share of ferrite. The 750 to 930 deg. F. embrittlement range becomes more pronounced with increasing chrome content. Compared with the austentic-ferritic chrome-nickel nitrogen steels with about 20 per cent chrome (Fig. 5), those with 25 per cent chrome (Fig. 6) show no increase in magnetic saturation even after extended annealing at 930 deg. F. Therefore, in these steels no austenite is transformed into martensite or ferrite owing to the higher chrome and also partly to the higher nickel content. Any decrease in the notch bar impact strength must, therefore, be due to the 750 to 930 deg. F. embrittlement range.

Also after a 100-hr. anneal at tem-

<sup>&</sup>lt;sup>12</sup> THE IRON AGE, 132 (1933), No. 10, p.

<sup>10/13.</sup> <sup>18</sup> Arch, Eisenhütt., 15 (1941/42), p.

<sup>&</sup>lt;sup>14</sup> Stahl und Eisen, 61 (1941), p. 852/60. <sup>18</sup> Arch. Eisenhütt., 15 (1941/42), No. 11.

TABLE II

Composition, Tensile Properties, Magnetic Saturation and Structure of Chrome Nickel Steel Samples With About 0.15 Per Cent and 0.25 Per Cent Nitrogen, After Water Quenching from 1100 Deg. C. (2012 Deg. F.) to Establish the Austenite-Ferrite Area in the Structure of the Chrome-Nickel Steels

,					Yield	Tensile	Elonga-	Reduc-	Impact *	Magnetic	S	TRUCTUR	E
Steel No.	C Per Cent	Cr Per Cent	Ni Per Cent	N <sub>2</sub> Per Cent	Limit Lb. Per Sq. In.	Strength Lb. Per Sq. In.	tion L=10D, Per Cent	tion in Area Per Cent	Strength Ft-L'b. Per Sq. In.	Saturation 4π∫00 Gauss	Austenite Per Cent	Ferrite Per Cent	Other Per Cent
13 14 15 16 17	0.09 0.12 0.10 0.08 0.14	19.23 18.75 18.25 18.23 19.17	2.39 3.08 3.87 5.49 6.42	0.148 0.159 0.141 0.153 0.162	149,000 130,000 111,000 51,000 49,000	200,000 181,000 165,000 126,000 108,000	3.8 9.2 16.2 40.1 44.6	6.2 15.3 21.1 49.6 46.3	17.4 24.6 48.5 132.4 177.2	11,960 12,350 8,920 820 430	100	25 5	Mart. Mart. Mart.
18 19 20 21 22 23	0.12 0.10 0.09 0.14 0.12 0.10	20.98 20.70 21.05 20.21 20.76 20.33	1.54 2.32 3.37 4.85 6.22 6.79	0.150 0.144 0.137 0.141 0.153 0.147	69,000 69,500 72,000 63,000 60,000 58,000	118,000 124,000 118,000 111,000 110,000 107,000	40.0 42.6 46.5 47.2 43.8 44.7	52.4 57.7 65.2 68.7 63.9 69.2	127.3 147.6 167.8 146.1 175.8 172.2	6.780 3,970 2,740 1,620 620 90	50 70 80 90 95 100	50 30 20 10 5	
24 25 26 27 28 29 30 31 32	0.13 0.14 0.11 0.15 0.13 0.12 0.11 0.13 0.09	24.02	1.21 2.38 3.32 4.57 7.10 10.75 12.22 12.52 13.17	0.153 0.150 0.144 0.142 0.134 0.137 0.162 0.143 0.138	70,500 89,000 90,500 85,000 85,500 85,500 69,500 66,000 67,000	105,000 105,000 109,000 109,000 110,000 113,000 107,000 104,000	22.2 23.0 25.8 27.2 34.2 33.4 36.6 38.6 35.2	55.0 60.0 59.0 61.5 60.7 59.3 58.5 61.8 59.7	17.4 34.0 98.4 128.0 134.5 140.3 154.1 167.8 172.2	8,680 7,540 6,320 4,630 3,080 2,060 950 110 80	30 45 55 65 80 90 95 100	70 55 45 35 20 10 5 0	
33 34 35 36 37	0.13 0.08 0.11 0.09 0.09	20.66 20.78 20.58 20.13 20.03	1.42 2.32 3.31 4.61 5.71	0.248 0.235 0.262 0.255 0.243	70,500 69,000 62,000 63,000 59,000	120,000 124,000 123,000 111,500 108,500	40.0 41.4 44.0 42.0 41.7	52.4 54.8 56.4 56.7 53.9	164.2 160.6 169.3 179.4 159.9	4,030 3,410 1,430 580 70	70 80 90 95 100	30 20 10 5	
38 39 40 41 42 43 44	0.12 0.11 0.11 0.11 0.13 0.13	25.08 24.96 24.96 25.38 24.39 24.92 25.03	1.42 2.35 2.32 4.66 7.34 9.53 12.01	0.261 0.259 0.268 0.253 0.239 0.246 0.251	74,000 89,000 89,000 87,000 89,000 82,000	103,000 114,000 118,000 118,000 118,000 116,000 110,000	19.0 27.0 28.5 30.0 32.2 34.4 33.6	51.0 60.3 62.8 61.5 60.4 58.2 59.7	15.2 68.0 85.4 118.6 128.8 149.0	9,720 6,660 5,680 4,010 2,730 1,890	25 45 60 70 80 90	75 55 40 30 20 10	

<sup>\*</sup> SAMPLE: 10x10x55 mm., NOTCH = 3 mm. x 2 mm. diameter.

peratures of 1110, 1290, 1470 deg. F. and sometimes 1650 deg. F. a certain amount of embrittlement will take place. At these temperatures the 750 to 930 deg. F. range can no longer have any influence, also no transformation of the austenite into martensite can take place since the magnetic saturation curves do not increase. The magnetic saturation even decreases slightly after protracted annealing between 1110 and 1470 deg. F. It is, therefore, very likely that the decrease in toughness after a 100-hr. annealing in the temperature range between 1110 and 1470 deg. F. is due to a precipitation of the non-magnetic iron-chrome compound.

These results show that the tendency towards embrittlement of austenitic-ferritic chrome-nickel-nitrogen steels after protracted heating at elevated temperatures is practically the same as in the austenitic-ferritic chrome-nickel steels without nitrogen.

Since the tendency towards embrittlement is more pronounced in austenitic - ferritic chrome - nickel-nitrogen steels after annealing at elevated temperatures than in the purely austenitic chrome - nickel - nitrogen steels, the use of purely austenitic chrome-nickel-nitrogen steels as rust and corrosion resistant material is recommended, if temperatures stresses above 570 deg. F. occur.

Also in the heat-resistant chromenickel steels, a part of the nickel can be replaced by nitrogen. Scale resistance is not reduced, as seen in Fig. 7.

These heat resistant nitrogen-bearing chrome-nickel or chrome-nickel-silicon steels are purely austenitic. Only so much nickel is replaced by nitrogen that a purely austenitic structure is still warranted for reasons stated above. From the scale loss curves it can be seen that the

nitrogen bearing austenitic chromenickel or chrome-nickel-silicon steels have a slightly better performance in spite of their lower nickel contents than the well-known heat resistant steel with 25 per cent chrome, 20 per cent nickel and 2 per cent silicon. Especially good was the steel containing 21.5 per cent chrome, 12:5 per cent nickel, 1.5 per cent silicon and 0.20 per cent nitrogen, which can be produced comparatively easily and which is somewhat superior to the 25-20-2 steel mentioned. It must be pointed out that such a chrome-nickel-silicon-nitrogen steel tends much less towards embrittlement at temperatures between 1110 and 1650 deg. F. It was shown that a loss in impact strength of only about 50 per cent occurred after a 100-hr. annealing at 1470 deg. F., while the 25-20-2 steel experiences an 85 per cent decrease after a similar treatment.

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# Diesel Gas Engine **Cuts Fuel Consumption** 25 Per Cent

N entirely new development in the diesel engine field, which will permit use of either gas or oil as fuel without any electrical sparking device, and which will cut fuel consumption of gas engines from 20 to 25 per cent, has been revealed by the Cooper-Bessemer Corp. The result of experimentation which began in 1927, this development enables the unit to operate on a wide variety of fuels including fuel oil, natural gas, manufactured and coke oven gases, sewage gas and refinery by-products.

The conversion from liquid to gas fuel can be made with the engine operating continuously at full load. Heretofore, in changing from one fuel to another, it has always been necessary to exchange major or minor parts of the

engine.

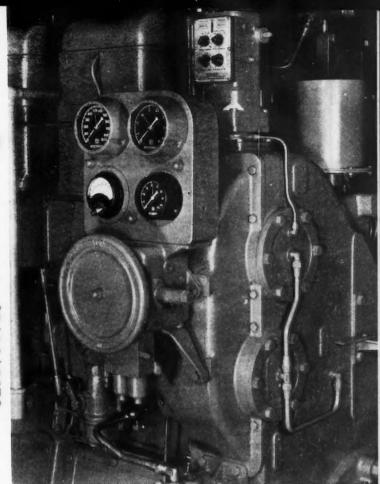
The usual 4-cycle gas engine operates on the same general principle as the better known 4-cycle gasoline engine. The ratio of gas and air is held constant and the quantity of the mixture is varied in accordance with the load demand by throttling the intake. At full load the compression pressure ranges from about 90 to 125 lb. per sq. in., depending upon the quality of gas. Ignition is always by means of spark. Two-cycle gaseous-fuel engines operate on the same principle, except that the air quantity is constant, while the gas is varied, producing a variable mixture.

The thermal efficiency of an internal combustion engine is a function of its compression pressure. For example, a 125-lb. compression engine usually results in a heat economy of about 10,000 B.t.u. per brake hp.-hr., while a 400-lb. compression engine usually has a heat economy of about 7500 B.t.u. per brake hp.-hr. On the Otto cycle engine, the compression must be held to the point where there is no danger of the mixture being ignited before the proper time, which limits its ef-

In 1927, Cooper-Bessemer had the idea of burning gas on the diesel cycle. Since it was assumed that there was no chance of compressing the mixture

VIEW of the control end of a Cooper-Bes-

semer type JS-8 diesel engine showing the gasoil operating mechanism. This engine is rated 675 hp. at 400 r.p.m.



### By RALPH L. BOYER

Chief Engineer, Cooper-Bessemer Corp., Mount Vernon, Ohio

to 400 lb. for the diesel cycle, arrangements were made to compress air only and then inject the gas on top dead center under 1000 lb. pressure. While it was possible to run a single cylinder test engine without any other ignition means, the engine performed much better if pilot oil injection was also used.

Since that time at least one other engine builder has taken up this development and has built and installed a number of large engines.

No thought was given at that time to the possibility of allowing the gas to go in with the intake air, because of the assumption that it would preignite. Actually, it is difficult to get gas to ignite at 400 lb. compression. Theoretically, at least, the temperature of ignition of a perfect mixture of natural gas and air is above the temperature reached with 400 lb. compression, and there is a minimum gasair ratio below which the mixture is not inflammable under atmospheric conditions, even when ignited with a spark. The point that was overlooked earlier was that due to the inherent

efficiency of the diesel cycle the amount of gas required is considerably less than with the Otto cycle and the gasair ratio at full load is still a very lean mixture, not too easily ignited.

Recently, it was found possible to admit the gas with the engine air intake and still be completely free of any evidence of premature ignition. In fact, on very heavy overloads with natural gas, the mixture will not fire without a pilot oil flame. Use of the latter is made attractive by the desirability of having an engine which can operate on either oil or gas.

Assuming a diesel oil engine in operation, if gas is admitted in the intake air the governor will immediately reduce the amount of oil to compensate for the energy being supplied by the gas. It then merely becomes necessary to reduce the fuel oil injection to the desired minimum and govern the percentage of gas according to load. To convert the oil engine to the gas engine it is, therefore, merely necessary to remove the fuel oil system from the governor, set it in the minimum position and connect the governor to the gas regulating valve. This can be done in a few minutes.

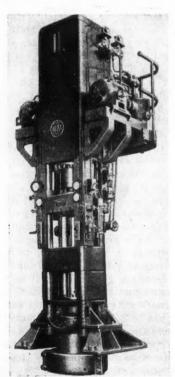
There are cases where the gas availability varies frequently and it is desirable to be able to instantly change (CONTINUED ON PAGE 112)

# New Equipment . . .

# **Presses**

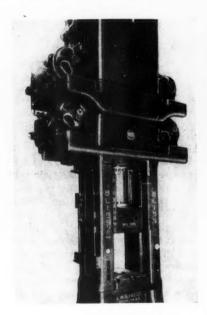
... Recent developments in hydraulic and mechanical presses, forming and bending machines and shears are described in the following pages.

200-TON press designed for ressing deep sections and also flanged objects of powdered metals where one portion of the work must be pressed at a different speed than another has been announced by E. W. Bliss Co., 53rd Street and Second Avenue, Brooklyn 32. The presses feature independent pressure control, stroke control and speed control of top and bottom slides. Separate pumping units are furnished for each slide so that the relation of speeds of the two slides can be infinitely varied to suit a wide variety of work. The presses are available in capacities ranging from 50 to 5000 tons. The 200-ton model is illustrated. Optional features include automatic loading devices and core rods for bushing work. The presses have electric control permitting the required sequence to be readily changed should a different type of work require a different sequence of slide movement.



### 500 Ton Nosing Press

A HIGH speed hydro-dynamic press of 500-ton capacity has been developed by E. W. Bliss Co., 53rd Street and 2nd Avenue, Brooklyn 32, especially for nosing 8-in. shell. The press is equipped with a 400 hp. pumping unit providing a 5½ sec. pressing cycle. To aid fast operation, the reversal is controlled by four-way valves of special design which permit a fast yet shockless reversal. Stroke

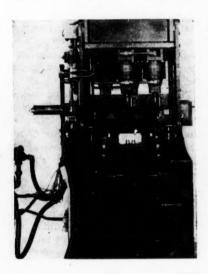


of the press is 24 in. Closing speed is 600 in. per min., pressing, 190 in., with reversal at 650 in. per min.

## Special Purpose Press

A MACHINE for pressing and staking wedge pins in place on the T-66 track shoe has been announced by Hydraulic Machinery, Inc., 12825 Ford Road, Dearborn, Mich. The machine is hydraulically operated, with cycle arranged for automatic or semi-automatic control. After the shoes are assembled in sections of ten, they enter the part of the machine

where the pins are manually inserted with the section taking its normal contour on the machine bed. A complete cycle takes place in 21 sec. Each of the four cylinders which actuate the rams has a capacity of 35 tons



or a combined rating of 140 tons. The power unit is installed adjacent to the press and contains pumps, motor, oil pressure reservoirs and relief valves.

#### **Bench Punch Press**

A HIGH speed precision punch press which can be used as a pipe vise, tensile of compression testing machine or a shear for plate or rounds has been announced by Reimuller Bros. Co., 9400 Belmont Avenue, Franklin Park, Ill. Using V ways to eliminate the use of die shoes, the press is designed for quick and efficient handling of many production jobs. It is made in 5-ton size and has a 5 x 6 in. platen with 7 in. of ram movement.

#### **Open Face Punch Press**

AN all purpose punch press illustrated below, suited to a wide range of small press work has been

announced by Maxant Bauton & Supply Co., 117 South Morgan Street, Chicago 7. The press has a large crosshead and construction is open face to permit quick change of dies for fast setup. Throat height is 10 in., distance of bed to slide is 71/4 in. and stroke is 21/2 in.

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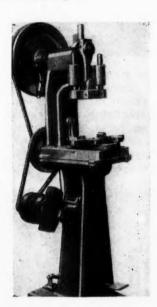
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### Pneumatic Die Cushion

COMPOUND pneumatic cushion now designed in three sizes has been announced by Dayton Rogers Mfg. Co., Minneapolis 7, for use where two independent blank holders are required on a compound banking, piercing and drawing die. The outer piston has maximum diameters of 12, 14 and 16 in. The inner piston has a minimum diameter of 5 in. The outside diameter of the inner piston can be increased or decreased to increase or decrease the draw ring holding pressure of the given compound die. The inner diameter of the outside piston can also be increased or decreased relative to the required draw ring holdng pressure required on a given die, compensating for a constant air pressure on the pneumatic die cushion cylinder itself.

# Radius Forming Brake

A RADIUS brake capable of forming duraluminum, chrome molybdenum, rust resistant and spring tempered alloys and other low ductile materials used in the fabrication of aircraft components has been announced by O'Neil-Irwin Mfg. Co., Minneapolis 15. Accuracy is guaranteed to a tolerance of 0.001 in. in all duplicated work. All contact sur-

faces of the Di-Acro radius brake are adjustable in all planes and angles, making it possible to obtain a true radius over the entire material width at the point of forming, regardless of



the degree of angularity. Maximum folding width is 12 in. Standard forming plates have radii form 1/16 to 3/16 in. in 1/32 in. steps.

#### **Motorized Press**

HYDRAULICALLY controlled Reimuller hy-speed gap style 10 and 20 ton motorized presses have been announced by Reimuller Brothers Co., 9400 Belmont Avenue, Franklin Park, Ill. A hand lever hydraulic valve controls the ram movement through feed, hold or return position. Other features include a hollow large area ram for holding punches and other fixtures, lapped ram, packless design, twin pressure gages showing pressure tons. The stroke of the ram is 12 in. A motor driven hydraulic pump furnishes 1% gal. oil per min. to the ram giving 1.5 in per sec. ram speed in the 10 ton and 0.8 in. per sec. for the 20 ton. The 10 ton furnishes four complete stroke per min. and the 20 ton furnishes two. The motor drive unit can be purchased separately equipped with a table to be used for testing hydraulic equipment or as a hydraulic test bench and furnishes up to 4500 lb. pressure per sq. in.

#### Automatic Tube Bender

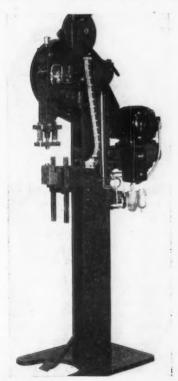
A SMALL size, high speed, full automatic bender for handling tubing up to 1 in. o.d., such as used in metal furniture and refrigeration applications, has been developed by Pines Engineering Co., Aurora, Ill. When equipped with a multiple angle selector, the bender will makeup to 50 tubular chairs per hr. with 8 bends in each chair. A special adaptation has been developed for making serpentine



coils. It incorporates the Pines booster attachment for automatically advancing the coil to position for the next bend. Through momentary contact of the start button, the bender completes the entire cycle and returns to starting position, including automatic ejection.

#### Pail Ear Riveter

N electrically powered T-J Rivitor A specially adapted to the job of piercing, dimpling and riveting bail ears on pails using 134 lb. tinners rivets has been announced by Tomkins-Johnson Co., Jackson, Mich. Rivets are underfed by the machine, as on a standard underfeed Rivitor. The unpierced pail and ear are placed over the rivet and properly located by gages. When the ram descends, a combination piercing and dimpling die mounted on a spring-actuated pressure pad attached to the ram forces the work over the rivet, piercing and forming a dimple in the pail and ear.



# Centerless Grinding Of Screw Threads

. . . Small headless socket screws are being ground on a production basis at a rate of 60 to 70 per min. on the first centerless type grinder developed for thread work. Design and operating principles of this revolutionary type of machine, which employs a crushed rib wheel, are described by the author.

DEVELOP-MENT of a centerless thread grinder makes it possible to grind 4/20

By MORRIS GJESDAHL
Research Engineer, Landis Tool Co.
Waynesboro, Pa.

headless socket screws from solid hardened blanks at the rate of 60 to 70 per min. in a single pass through the machine, a decided increase in production rate over the present method of cutting threads on this type of screw. Set screws ranging in size from No. 4-40 pitch up to % in.-11 pitch have been ground in production on a new unit just announced by the Landis Tool Co., Waynesboro, Pa. Experimentally, hardened steel rings 5

in. diameter, 16 pitch have been ground in two passes. Screws 12 in. long, ¼ in. diameter, 20 pitch

have been ground with excellent re-

The idea of grinding screw threads on a centerless grinding machine was first suggested on Feb. 24, 1943, by M. A. Hollengreen, vice-president and general manager of Landis Tool Co. He also proposed forming the required grooves on the grinding wheel by means of crushing, using cylindrical crushers with annular grooves. In the development of the Landis Tool cen-

terless grinder, Fig. 1, the essential elements of the Landis No. 12 centerless grinder (THE IRON AGE, May 11, 1944) are utilized, but many more adjustments are provided for the regulating wheel and the position of the work rest is different.

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As shown in Fig. 2, at A, the grinding wheel base may be moved laterally to increase or decrease the throat between the grinding wheel and regulating wheel. Movements of the grinding wheel base as small as 0.0001 in. may be made by means of the handwheel. The regulating wheel and its base is universal in its movements as shown by the arrows in Fig 2. It also can be moved laterally as shown at A to increase or decrease the throat and be located as required for various diameters of work with respect to the stationary work rest. It can be adjusted forward or backward as shown at B and in addition has a hydraulic traverse movement in this direction for the diamond dressing of the regulating wheel on the exact line of contact of the work. The diamond is fixed on the work rest. A swivel plate permits rotation of the regulating wheel base to adjust the regulating wheel parallel to the grinding wheel or at an angle if taper work is to be ground. Probably the most important adjustment and the one most often used on the Landis Tool centerless thread grinder is that shown at B. The entire regulating wheel base may be tilted to the required angle to provide the feeding action through the throat between the grinding wheel and the regulating wheel. The adjusting screw is graduated so the angle may be adjusted to the nearest min-

The feeding through action of the regulating wheel may be explained by means of a vector diagram, Fig. 3. Let  $V_r$  represent the peripheral velocity of the point O of the regulating wheel. This equals the circumference of the regulating wheel times the revolutions per minute. The angle a is the tilt angle. Then the vector  $V_w$  represents the axial speed of the work across the face of the regulating wheel and is equal to the velocity  $V_r$  times a. The vector  $V_w$  represents the

FIG. I—Landis Tool centerless thread grinder brings production of ground threads within range of thread rolling practice.



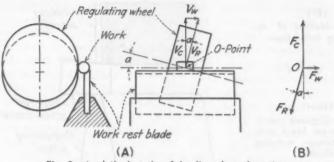
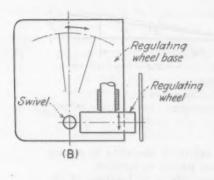


Fig. 3—Analytical study of feeding through action.



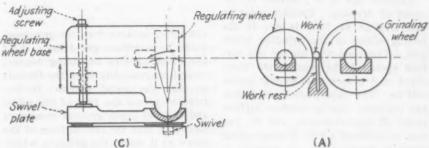


Fig. 2—Adjustments of grinding wheel base and regulating wheel base.

peripheral velocity of the point O of the work piece. The velocit  $V_*$  is equal to the velocity  $V_*$  times cost a. A resolution of forces is shown at B. Here the tangential braking force  $F_*$  of the point O on the regulating wheel is the resultant of the forces  $F_*$  and  $F_*$  represents the tangential force at the point O on the surface of the work and  $F_*$  represents the force producing axial movements of the work.

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An appreciation of the preceding analytical study is essential to the application of the centerless grinding machine to the grinding of screw threads. The angle a in Fig. 3 represents the helix angle for the screw thread being ground, and is shown as the angle between the path of the center of the screw and the axis of the regulating wheel spindle.

#### Centerless Grinder Modified

The adaptation of the Landis No. 12 centerless grinder to thread grinding involved several changes in its design. First, a crusher dresser attachment has been built into the grinding wheel base with a separate motor drive for this unit. This is in addition to the standard hydraulically operated diamond dresser for the grinding wheel. Second, an auxiliary speed reduction has been provided for the regulating wheel so that its rotative speed can be further reduced. Third, a new type work rest has been designed to meet the special requirements for thread grinding. Fourth, the electrical controls have been engineered to provide flexibility of operation.

The crusher is driven through a worm gear reduction by a constant speed motor and is fed into the grinding wheel face by a graduated handwheel. The crusher is cylindrical in form and is readily replaced. (See Fig. 4). Provision is made in the grinding of the crusher profile that all crushers made for a given pitch are interchangeable so that alinement with the form on the wheel is assured. Driving the crusher during the crushing operation instead of the grinding wheel offers an advantage which per-

mits regrinding to renew the form on a worn crusher. A substantial saving in crushers is realized.

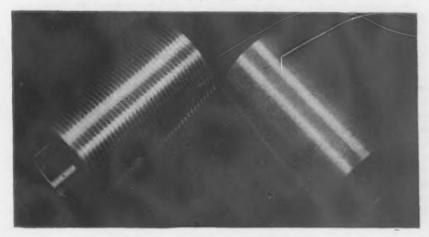
The auxiliary speed reduction for the regulating wheel and a clutch arrangement permits changing from the standard speed range of 12 to 96 r.p.m. to a low speed range of 2 to 16 r.p.m. The same rheostat can be used to obtain the desired speed in either range.

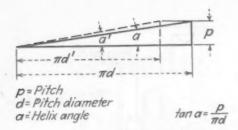
The work rest requirements in centerless thread grinding are different from those of ordinary centerless grinding. Because of inherent design features, the throat or opening through which the screw stock passes is variable on the No. 12 machine. The work rest for the centerless thread grinder, on the other hand, provides side blades which move parallel to each other, so that the screw stock has a constant width throat through which to pass no matter what the slope angle of the blade is. In addition the time re-

quired to change the setup from onescrew size and pitch to another has been materially reduced by the provision of wedges ground to the proper tilt angle for each pitch and diameter of screw.

One drum type switch having five stations is used for control of the machine. These stations are: Setup, where only the hydraulic pressure oil pump is in operation; grind, where the grinding wheel, regulating wheel and coolant pump are in operation; dress, where the grinding wheel is in operation, the regulating wheel is running at dressing speed of 300 r.p.m., the coolant pump and the hydraulic pressure pump are running; crush, where only the crusher drive motor and the coolant pump are running; regrind, where the crusher drive motor, the grinding wheel motor and the coolant pump are running. Interlocking is provided in this drum switch in-

Fig. 4—Crushers used for forming grinding wheel. The grooves are annular.





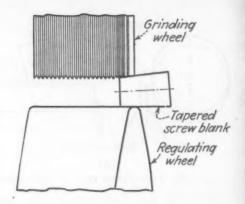
suring safety of operation in moving from one station to another.

Crusher life is a function of the speed of dressing. Crusher wear or deterioration of form is due to the honing action of the grinding wheel grit. Therefore the higher the surface speed of the crusher the more rapid and severe the honing action will be. The experience gained thus far indicates that a crusher surface speed of approximately 150 ft. per min. in crushing a 4 in. wide grinding wheel is satisfactory. In general it takes about 1 min. of crushing to remove 0.001 in. from the radius of the grinding wheel. Thus, if 0.004 in. of the radius must be removed from the groove form on the face of the wheel, the time required will be approximately 4 min. Usually an extra minute is allowed during which time the crusher is not fed further against the wheel. This "drifting" of the grinding wheel permits a sharpening of the groove form on the grinding wheel face as the pressure due to crushing is gradually relieved. In grinding some sizes of screws it has been possible to grind for a day or more before recrushing the wheel to renew the form. The total time required to recrush the wheel is about 10 to 12 min.

The diamond dresser is used for truing before any grooves are crushed into the grinding wheel and also for dressing the chamfer or "throat" at the entrance edge after the grooves have been crushed. Chamfering of LEFT
FIG. 5—Method of determining helix angle.

RIGHT

FIG. 6—Tapered hardened screw blank with
small diameter entering
throat.



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the wheel is done for two purposes: First, to centerless grind the o. d. of the blanks before threading begins; second, to gradually form the threads so that the metal removal is distributed across the face of the wheel and the full depth grooves remain to clean and true the thread form of the screw as it leaves the grinding wheel.

#### Modification of Helix Angle

In order for the screw to thread its way through the throat between the grinding wheel and the regulating wheel it is essential that the path of the screw have the proper relation with respect to the grinding wheel axis and to the regulating wheel axis. The grinding wheel axis must be at the helix angle with respect to the path of the screw.

Grinding to a pitch diameter different from the basic pitch diameter changes the helix angle. As shown in Fig. 5 the tangent of the helix angle a is equal to the pitch distance p divided by the circumference of the pitch diameter circle ( $^{\pi}d$ ). Decreasing the pitch diameter reduces the pitch circle circumference to ( $^{\pi}d$ '). With no change in the pitch distance, the helix angle is increased from a to a'. Since the pitch of the thread is constant and dependent upon the spacing of ridges on the grinding wheel, it has been found

that the setup requirements involving the helix angle are critical. An example will illustrate this point. The table of standards for class 3 fit of screw threads gives the following values for ¼ in., 20 pitch:

			Basic	Min. Values
Major	diameter,	in.	 0.2500	0.2428
Pitch	diameter,	in.	 0.2175	0.2139
Helix	angle		 40 11'	4* 15'

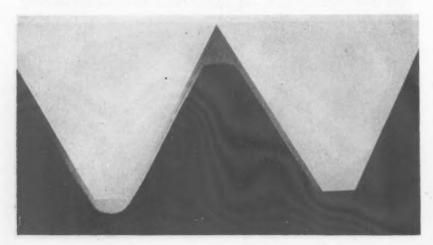
Suppose the screw blanks to be ground are less than 0.250 in. say 0.248 in., then in order to centerless grind the o. d. some dimension must be selected and for this example 0.246 in, shall be used. The pitch diameter of the screw is to be 0.216 in. which is a little above the average pitch diameter for a class 3 fit. For this pitch diameter the corresponding helix angle is 4 deg. 13 min. The slope of the top of the work rest blade with respect to the centerline of the grinding wheel spindle will be increased about 0.003 in, in a length of 5 in., that is, 0.003 in. more than what would be the slope for the helix angle of 4 deg. 11 min. for the basic pitch diameter. This consideration of the change in the helix angle due to grinding below the basic pitch diameter is critical in the smaller diameters, specifically those under % in.

Once a pitch diameter has been selected, such as 0.216 in. for 4—20 screws, it is possible to maintain this value consistently within a tolerance of 0.0005 in. as long as the groove form will pass inspection for a class 3 fit.

With grinding wheel to the right of the screw and its axis horizontal, the top of the work rest blade must slope downward toward the rear of the machine at the helix angle. Likewise the regulating wheel which has no grooves on its face must assist in rolling the screw through the machine. Its axis must be tilted downward at the helix angle with respect to the top of the work rest blade so that its angle with respect to the grinding wheel axis is double the helix angle.

In setting up the centerless thread grinder the height of the centerline

Fig. 7—Comparator picture of ground screw thread form magnified 50 times.



of the screw is first located in accordance with data furnished for each size of screw. Adjustment of this height is made by moving the wedge under the blade forward or back. The regulating wheel is then dressed on the line of contact, obtained by sliding a screw blank on the stationary regulating wheel surface, after which the regulating wheel base is tilted to double the helix angle. The side blades, first on the regulating wheel side and then on the grinding wheel side are finally adjusted as for any other centerless grinding, allowing clearance so screw blanks do not touch these blades.

The grinding wheel is brought in when not rotating until contact against the screw blank makes sliding along the blade difficult. The wheel is then rotated and fed in by handwheel to give the required depth of grind. After a sample or two have been ground and the wheel base properly adjusted for depth of thread, the screw blanks may be fed to the machine either manually or by means of an automatic loader.

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The relationship between the major diameter of the screw being ground on the centerless thread grinder and the pitch diameter is constant. This is true if the screw blank is ground on the major diameter throughout its length while the screw thread is being formed. The reason for this constant relationship is that the outside of the screw rides on the regulating wheel and the depth of cut by the grooves in the grinding wheel is controlled by the diameter of the blank. The action may be better understood by reference to Fig. 6, which shows a tapered blank with the small diameter entering the throat. Since the major diameter is not ground on the small end of the blank, the grinding wheel grooves will not cut full depth, but as the large end goes through, the major

diameter is ground and the thread depth is complete. Therefore, the leading end of the screw will have a larger pitch diameter than the trailing end.

Another factor which applies in this constant relationship of the major diameter and pitch diameter is due to the groove form on the crusher. Except for the fact that the grooves on the crusher are annular (that is, do not form a helix) and the groove on the screw is a helix, the depth of the groove form and the width of top flat and width of bottom flat will be almost identical. As long as the grinding wheel grooves remain the same and show no signs of wear the screw as it leaves the throat between the two wheels will be constant in major diameter and pitch diameter, provided the blank is of constant diameter to begin with or providing the major diameter is ground on the screw throughout its length.

As the wheel gradually wears away on the tops of its ridges, the depth of the thread decreases. When the minor diameter no longer passes the gage, the wheel must be recrushed. During the grinding of many screws, the thread riding on the regulating wheel surface tends to crush shallow grooves in the regulating wheel, causing the major and pitch diameters to increase. This crushing or grooving of the rubber bonded regulating wheel is very gradual and may be compensated by moving the grinding wheel toward the regulating wheel 0.0002 to 0.0003 in. When this adjustment has been made it is only necessary to check the major diameter of the screws because they will be the same on the pitch diameter as those ground initially. When the depth of the grooves in the regulating wheel becomes too great, the wheel is dressed smooth again. Dressing is necessary about once a day.

In grinding headless socket set screws, say of 4-in. diameter with

cup point, it does not matter which end enters the machine first, nor does it matter if all the blanks line up with cup point first. Therefore, an automatic loader which will feed the blanks in line into the machine permits an operator to spend his time checking an occasional screw from one or more machines. Checking the form on a visual shadow gage or a ring gage will indicate whether the grinding wheel should be moved in a little or whether the form should be renewed by crushing.

A loader of the vibration type has been developed at the Landis Tool Co. which can automatically feed 1/4 in. diameter by 1/2 in. long screw blanks at a rate as high as 85 per min. It is only necessary that the operator keep the hopper filled.

#### Production Data

During the period the experimental centerless thread grinder has been in operation it has been grinding threads on commercial socket set screws varying in size from No. 4—40 pitch to %—11 pitch from a hardened solid screw blank in one pass through the machine.

It has been found that an economical rate of grinding 14-20 screws is about 30 to 35 in. of length per min. This means that if the blanks are 1/2 in. in length the quantity rate is 60 to 70 per min. It has been possible on many occasions in grinding 1/4 in. screws to operate continuously for 8 hr. without recrushing the form on the wheel. During this time from 12,-000 to 16,000 screws of the 1/2 in.length will have been ground. Checking screws while the machine operates eliminates any further necessity of inspection. The only difference between the first and last screws is in the minor diameter. Initially the root of the thread would have had a narrow width and a minor diameter near the

(CONTINUED ON PAGE 106)

# Properties of Thorium-Bearing Heat-Treatable Steels

THE effect of additions of thorium to three low-alloy steels (alloyed with vanadium, chromium and molybdenum, respectively) and one plain carbon steel, all containing about 0.3 per cent carbon and about 1.8 per cent manganese is described by H. Cornelius in Archiv fur das Eisenhuettenwesen, vol. 17, July to August, pp. 23 to 27.

The effect of adding up to 1.4 per

cent thorium to heat-treatable steels is governed primarily by the formation of the exceedingly stable carbide ThC<sub>2</sub>, which is practically insoluble in solid iron at temperatures up to 2444 deg. F. In spite of this, the hardening temperature range is only extended a little. The effect of the insolubility of thorium carbide in solid iron is that the steel loses its heat-treatability entirely if the thorium content

amounts to about 10 times the carbon content and is sufficient to convert all the carbon into thorium carbide. The presence of large amounts of thorium carbide in heat-treated steel also reduces its toughness. The scaling resistance of steels at 1202 deg. and 1472 deg. F. was not improved by the addition of thorium. If addition exceeds a few tenths of 1 per cent, the effect is liable to be detrimental.

# Nitrogen In Chrome-Nickel Steels

. . . Shown here are the improvements in mechanical and electrical properties resulting from a partial substitution of nitrogen for nickel in austenitic and austenitic-ferritic chrome-nickel steels. This is a translation by C. M. Cosman of an article in Stahl und Eisen, by R. Scherer, G. Riedrich and H. H. Kessner.

TRON and steel generally contain very little nitrogen, but chromium and chromium alloys contain considerable amounts of this element. As long ago as 1926, F. Adcock1 brought this point to general attention. He also observed that nitrogen causes certain changes in the microstructure of low-carbon steels with 17.5 per cent and 24.5 per cent chromium. Adcock noted islands of a martensitic or pearlitic character

after quenching these steels from 1250 deg. and 1220 deg. C. (2282 deg. and 2228 deg. F.) respectively. Between 1934 and 1935 V. N. Krivobok<sup>a</sup> suggested that this condition is caused by a shift in the boundaries of the gamma phase to higher chromium contents, and in this respect nitrogen would act like carbon. In the years 1933-35 R. Franks' showed that nitrogen causes a grain refinement in ferritic-chrome steels in the as-cast condition, that it produces a considerable reduction in grain growth after hot working, when held at elevated temperatures and that it causes an increase in the yield limit of austenitic 18-8 steel.

G. Riedrich' demonstrated in 1940 on non-magnetic structural steels with 17 to 18 per cent manganese that nitrogen produces an increase in the yield limit of austenitic-manganese-chrome steels which corre-

sponds in magnitude to that achieved in the austenitic 18-8 steel, and that nitrogen exerts a stabilizing influence on austenite. In the same year R. Scherer pointed out that nitrogen improves the deep-drawing properties of 18-8 steel and showed that in highly alloyed chrome-nickel steels 0.10 per cent nitrogen can replace 3 to 4 per cent nickel. At about the same time W. Tofaute and H. Schottky' confirmed this contention on steels with about 23 per cent chromium. Already in 1939 F. Rapatz suggested in a secret session of the conference on alloyed steels that nitrogen might replace nickel to some extent in the manufacture of austenitic stainless steels.

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Fig. 1 shows the influence of increasing nitrogen contents on the yield limit (0.20 per cent) of austenitic 18-8 steels. Stainless steel to which no nitrogen had been intentionally added, contained 0.015 per cent nitrogen and had a yield limit of 21.4 kg. per sq. mm. (30,540 lb. per sq. in.). Up to a nitrogen content of 0.04 per cent the yield limit remained unchanged, when the steel contained 0.07 per cent nitrogen it rose to 24.2 and at 0.11 per cent nitrogen reached 29.1 kg. per sq. mm. (34,420 and 41,390 lb. per sq. in.). Further nitrogen additions do not influence this value to any considerable extent. Therefore, in order to reach the maximum yield limit, 18-8 steels require 0.10 to 0.12 per cent nitrogen.

Also, in austenitic-ferritic chromenickel steels the yield limit is raised by nitrogen to a similar extent. Thus, an austenitic-ferritic steel containing 60 per cent austenite and 40 per cent ferrite (steel No. 4, Table I), had a yield limit of 43.6 kg. per sq. mm. (60,590 lb. per sq. in.) without nitrogen. (This value which is considerably higher than that obtained with an 18-8 steel must be attributed to the 40 per cent ferrite content.7) An austenitic-ferritic steel with a similar austenite and ferrite content bearing 0.14 nitrogen (steel No. 5, Table I) has a yield limit of 52.7 kg. per sq. mm. (75,000 lb. per sq. in.). Also, these austenitic-ferritic steels do not experience a further improvement in

## TABLE I

Yield Limit [0.2%] of Ausenitic and Austenitic-Ferritic Chrome-Nickel Steels, and Austenitic Manganese-Chrome Steels With and Without Nitrogen, After Quenching in Water from 1920 Deg. F.

							Yield '	STRUCTURE	
Steel No.	C Per Cent	Si Per Cent	Mn Per Cent	Cr Per Cent	Ni Per Cent	N <sub>2</sub> Per Cent	Limit Lb. Per Sq. In.	Austenite Per Cent	Ferrite Per Cen
1	0.08	0.31	0.59	17.37	8.82		30,000	100	0
2	0.11	0.48	0.42	18.03	8.61	0.13	41,500	100	0
3	0.10	0.37	0.48	17.68	8.52	0.17	42,000	100	0
4	0.10	0.53	0.55	25.44	8.45		62,000	60	40
5	0.13	0.54	0.68	25.26	4.96	0.14	75,000	60	40
6	0.11	0.52	0.48	25.96	3.49	0.29	77,000	60	40
7	0.12	0.68	0.75	26.26	3.32		69,000	20	80
8	0.14	0.73	0.61	25.36	1.41	0.15	66,000	20	80
9	0.34	0.32	17.93	5.81	1.77		35,000	100	0
10	0.32	0.44	18.03	6.72	2.04	0.09	51,000	100	0 0
11	0.15	0.82	7.78	14.44	1.52		36,000	100	0
12	0.16	0.68	7.93	14.96	1.42	0.11	51,500	100	0

<sup>1</sup> J. Iron and Steel Inst., 114 (1926) p. 117/26.

Metal Progress, 26 (1934), No. 5, p. 21/25.

THE IRON AGE, 132 (1933), No. 10, p. 10/13.

<sup>\*</sup>Stahl und Eisen, 60, (1940), p. 815/18. \*Chem. Fabrik, 13 (1940), p. 373/79. \*Arch. Eisenhütt., 19 (1940/41), p.

<sup>71/76.</sup> Arch. Eisenhütt., 13 (1939/40), p. 53/57

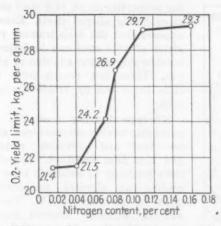


FIG. 1—Influence of nitrogen on the yield limit of 18-8 steel.

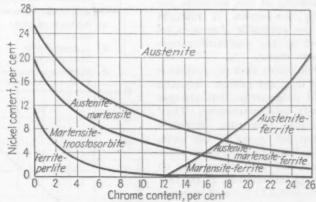


Fig. 2-Structure diagram of chrome-nickel steels.

the yield limit by further nitrogen addition, as shown by a chrome-nickel steel with 0.29 per cent nitrogen, 60 per cent austenite and 40 per cent ferrite (steel No. 6, Table I).

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In austenitic-ferritic chrome-nickel steels with austentite contents below 40 per cent, the yield limit is not increased by nitrogen. The nitrogen bearing austenitic-ferritic chrome-nickel-steel (steel No. 8, Table I) with 20 per cent austenite and 80 per cent ferrite has practically the same yield limit as the austenitic-ferritic chrome-nickel steel (No. 7, Table I) of similar structural composition without nitrogen. The other mechanical properties are not influenced by nitrogen to any considerable extent, the microstructure being constant.

The austenitic - manganese - chrome steels experience very similar increases in the yield limit (steels Nos. 9 to 12, Table I).

As pointed out in the introduction, nitrogen expands the gamma phase in chrome-bearing steels towards higher chromium contents similar to carbon<sup>2</sup>. This effect has also been observed in highly alloyed chromenickel steels, so that in the phase diagram the boundaries of the austenitic-ferritic area are shifted towards higher nickel contents by increasing the nitrogen in the steel.

In Fig. 2 the phase diagram of chrome-nickel steels shows the constitution of austenitic-ferritic steels with 0.10 per cent carbon. It will be seen that an 18 per cent chrome steel with about 7 per cent nickel lies just above the austenite-ferrite or austenite-martensite-ferrite area, that a 20 per cent chrome steel must contain at least 9.5 per cent nickel in order to be purely austenitic, and a 25 per cent chrome steel requires at least 18 per cent nickel. In order to keep a 20 per cent chrome steel in the austenite-ferrite area about

5.5 per cent nickel are required and 4 per cent nickel for a 25 per cent chrome steel.

Fig. 3 shows the austenite-ferrite phase of chrome-nickel steels with about 0.10 per cent carbon which contain about 0.15 per cent and 0.25 per cent nitrogen additionally. Details are given in Table II, and for greater simplicity only chrome-nickel steels with about 0.15 per cent nitrogen have been entered in Fig. 3. Furthermore, the boundaries of the austenite-ferrite area of chrome-nickel steels without nitrogen have been entered in thin lines. The 18 to 20 per cent chrome corner of the austenite-ferrite phase with about 0.25 per cent nitrogen is dotted, since chrome-nickel steels with less than 20 per cent chrome and a nitrogen content of 0.25 per cent can be manufactured only with difficulty. From this diagram it is clear that nitrogen has the effect of shifting the boundaries of the austeniteferrite area towards lower nickel contents, and the quantity of nickel replaced by nitrogen on the basis of microstructure is clearly seen. The following table summarizes the conclusions reached:

Therefore, depending on the amount of chrome contained, 0.15 per cent nitrogen can replace 2 to 4 per cent nickel, and 0.25 per cent nitrogen 2.5 to 6 per cent nickel.

For corrosion resistant materials both austenitic and austenitic-ferritic chrome-nickel steels are important, up to 20 per cent ferrite. Such ferritic steels are almost equal to the purely austenitic ones in respect to toughness. Austenitic-ferritic chromenickel steels with 10 to 20 per cent ferrite are more resistant against intergranular corrosion than purely austenitic steels and can be made completely stable by suitable heat treatment. The same is true for nitrogen - bearing austenitic - ferritic chrome-nickel steels. As Table II shows, austenitic - ferritic chromenickel steels preserve their good mechanical properties up to 30 per cent ferrite.

For corrosion resistant applications, therefore, austenitic and austenitic-ferritic chrome-nickel-nitrogen steels with 0.10 per cent carbon, 20 to 25 per cent chrome, 4 to 4.5 per cent nickel and 0.20 per cent nitrogen can be used. These steels have good

Nitrogen Replaces Nickel in Forming Austenitic Structure						
Per Cent Nitrogen	in (Per Cent) Chrome Steel	Needs (Per Cent) Nickel	to become			
0.15 0.15 0.15 0.25 0.25 0.15	18 20 25 20 25 20 25	5.5 6.5 14.0 5.5 12.0 2.5 1.0	austenitic purely austenitic purely austenitic purely austenitic purely austenitic austenitic-ferritic austenitic-ferritic			

Typical Data Taken From Table II							
Steel No.	With (Per Cent) Ferrite	Has (Per Cent) Elongation	And Impact (Ft-Lh. Per Sq. Cm.) Strength				
19 28 41	30 20 30	42.6 34 30	- 147.6 134.5 118.6				

machinability, toughness and chemical and inter-crystalline stability.

The stability of the austenite improves by the action of nitrogen both on the austenitic chrome-nickel steels and on the austenitic-manganese-chrome steels.

It is well known that the austenitic 18-8 steel does not remain austenitic after cold deformation, but changes increasingly into martensite. Thus the magnetic saturation increases from about 500 gauss in the undeformed condition to 1300 gauss after 20 per cent and 7000 gauss after 60 per cent cold deformation. In the 18-8 steel containing 0.15 per cent nitrogen no noticeable increase occurs in the magnetic saturation during a similar degree of cold deformation (Fig. 4). In the nitrogen bearing 18-8 steel, therefore, practically no austenite is transformed into martensite by cold deformation, which again can be explained by the increased stability of the austenite in nitrogen bearing chrome-nickel steels.

The faculty of work-hardening cold deformation is, however, not impaired by the austenite-stabilizing action of nitrogen. For, the tensile strength of the nitrogen bearing 18-8 steel increases by cold work almost as much in the nitrogen-free as in the nitrogen-bearing steel. The same is true for austenitic-chrome-manganese steel.

Therefore, alloying of stainless steels with nitrogen offers materials which combine high tensile strength

FIG. 3—Shift in the austenite-ferrite areas in the phase diagram of chromenickel steels by the addition of 0.15 and 0.25 per cent N<sub>2</sub>.

(256,000 to 285,000 lb. per sq. in.) with absence of magnetism.

The austenite-stabilizing action of nitrogen is favorable, furthermore, in all cold-deformation processes, especially in the manufacture of deep drawn parts. Here, deep-drawing properties were determined by the wedge deep-drawing tests (Keilzug-Tiefungsverfahren<sup>10</sup>) which was found very satisfactory. Tests show that the nitrogen content of 0.15 per cent produces the same deep-draw-

ing properties on an 18-8 steel as the more highly alloyed steels. Hence it appears that the deep-drawing properties of 18-8 steel can be improved considerably by the addition of nitrogen. These test results have been fully borne out by practical experience.

Nitrogen bearing austenitic and austenitic-ferritic chrome-nickel steels are rust and corrosion resistant and also heat resistant. Therefore, their tendency to embrittle after annealing at elevated temperatures must be investigated. W. Tofaute and H. Schottky' showed that a nitrogen bearing chrome-nickel steel with 0.06 per cent carbon, 22.5 per cent chrome, 4.13 per cent nickel and 0.29 per cent nitrogen embrittles most pronouncedly after extended exposure to a temperature of 930 deg. F. The austenitic 18-8 steel experiences the most drastic loss in toughness after annealing at 1470 deg. F.11. This difference in behavior is not attributable to the nitrogen content, as shown by test results obtained with chromenickel-nitrogen steels with about 20 to 25 per cent chrome, after long term annealing at 390 to 1650 deg. F. (Figs. 6 and 7).

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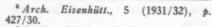
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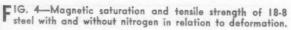
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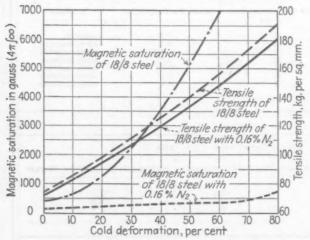
In Figs. 5 and 6 the embrittlement of austenitic chrome-nickel-nitrogen steels (Nos. 23, 32, Table II) after a 100-hr. anneal at temperatures between 390 and 1650 deg. F. is most pronounced at 1470 deg. F. Therefore, purely austenitic nitrogen-bearing chrome-nickel steels behave similar to the chrome-nickel steels without nitrogen, in respect to embrittlement after long term annealing at elevated temperatures. Whether the tendency towards embrittlement

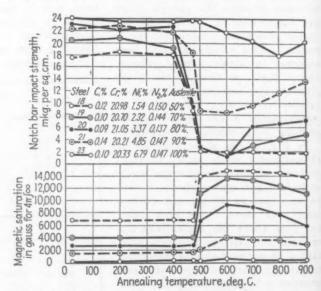


<sup>&</sup>lt;sup>o</sup> Stahl und Eisen, 61 (1941) p. 1076. <sup>10</sup> Stahl und Eisen, 54 (1934), p. 993/98. Mitt. Komge-U. Eisenforsch., 2, (1939), p. 141/55.

<sup>&</sup>lt;sup>11</sup> F. Anorg. Allg. Chemie, 188 (1930), p. 309/24.







F1G. 5—Notch bar impact strength and magnetic saturation, after 100-hr. anneal at 200 deg. to 900 deg. C., for steels with about 20 per cent Cr. 0.15 per cent N<sub>2</sub> and 1.5 to 7 per cent Ni. Steels previously water quenched from 1100 deg. C.

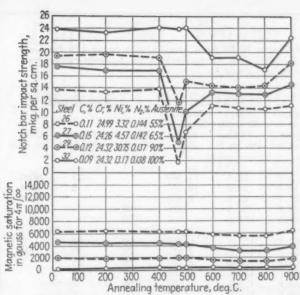
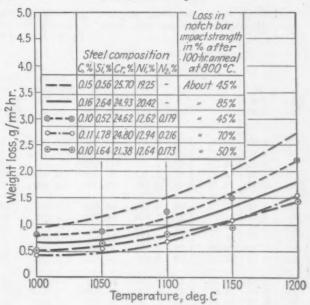


FIG. 6—Notch bar impact strength and magnetic satura-tion at 200 deg. to 900 deg. C., for steels with about 25 per cent Cr, 0.15 per cent N2 and 3 to 13 per cent Ni. Steels previously quenched in water from 1100 deg. C.

FIG. 7—Scale resistance of austenitic Cr-Ni steels with and without nitrogen.



in austenitic chrome-nickel steels is enhanced by the presence of nitrogen or reduced12 will require still further tests.

Austenitic - ferritic chrome - nickel steels exhibit a tendency towards embrittlement which is distinct from the basis of magnetic saturation de-After a 100-hr. anneal at temperatures up to 750 deg. F. no reduction in Izod values is observed, just as in the austenitic chrome-nickel-nitrogen steels. After a 100-hr. anneal above that temperature, however, the notch bar impact strength decreases considerably.

In the austenitic-ferritic steels Nos. 18, 19, 20, 21 (Table II) a minimum value for the notch bar impact strength is obtained after a 100-hr. anneal at 930 to 1110 deg. F. (Fig. 5). After a 100-hr. anneal above 1110 deg. F. the notch bar impact strength increases again with the exception of steel No. 18, which has the lowest nickel content.

The difference between purely austenitic and austenitic-ferritic chromenickel-nitrogen steels Nos. 18 to 21 in respect to embrittlement resides in the tendency of the ferrite to embrittle at 750 to 930 deg. F. and in the instability of the austenite after a 100-hr. anneal at 930 to 1650 deg. F., owing to the low nickel content. This difference was established on the basis of magnetic saturation determination. The decrease in impact strength of these steels after annealing at temperatures above 750 deg. F. is caused largely by the 750 to 930 deg. F. embrittlement range, e.g. at 882 deg. F. annealing causes no change in the magnetic saturation. It is well known that the 750 to 930 deg. F. embrittlement range of ferriticchrome steels does not influence the magnetic saturation13. At 930 deg. F. further embrittlement is caused by an additional factor, which reduces Izod values still further. Actually the impact strength should increase again at 930 deg. F., since the tendency of the ferrite to embrittle is lower at that temperature than at 882 deg. F.13. The more pronounced decrease in the impact strength after a long term anneal at 930 deg. F. must, therefore, be attributed to a partial transformation of the austenite into martensite, because the magnetic saturation increases considerably, and more strongly the lower the nickel content.

A 100-hr. anneal at 1110 deg. F. compared with that at 930 deg. F. leaves the notch bar impact strength practically unchanged although magnetic saturation measurements would point to a stronger decomposition of the austenite. This effect is explained by the decreasing influence of the 750 to 930 deg. F. embrittlement range. Both the notch bar impact strength and the magnetic saturation of steel No. 18 with the lowest nickel content are unchanged after a 100-hr. anneal at temperatures above 1110 deg. F. and in the three steels with higher nickel contents. The Izod values increase after annealing for 100-hr. at temperatures above 1110 deg. F. While the magnetic saturation curves decrease, the higher notch bar impact strength after long-term annealing at temperatures above 1110 deg. F. must be due to an incipient decrease in the austenite-martensite transformation. However, the magnetic saturation of purely austenitic chrome-nickel-nitrogen steels Nos. 23 and 32 remain unchanged after annealing for 100-hr. at elevated temperatures (1110 to 1650 deg. F.). An explanation for this effect cannot be offered at this time.

The three austenitic-ferritic chromenickel-nitrogen steels containing about 25 per cent chrome, Nos. 25, 27 and 29 (Table II) show the strongest embrittlement after extended annealing at 882 deg. F. (Fig. 6) which is the more considerable the greater the share of ferrite. The 750 to 930 deg. F. · embrittlement range becomes more pronounced with increasing chrome content. Compared with the austentic-ferritic chrome-nickel nitrogen steels with about 20 per cent chrome (Fig. 5), those with 25 per cent chrome (Fig. 6) show no increase in magnetic saturation even after extended annealing at 930 deg. F. Therefore, in these steels no austenite is transformed into martensite or ferrite owing to the higher chrome and also partly to the higher nickel content. Any decrease in the notch bar impact strength must, therefore, be due to the 750 to 930 deg. F. embrittlement range.

Also after a 100-hr. anneal at tem-

<sup>&</sup>lt;sup>23</sup> THE IRON AGE, 132 (1933), No. 10, p.

<sup>10/13.

18</sup> Arch, Eisenhütt., 15 (1941/42), p.

<sup>&</sup>lt;sup>14</sup> Stahl und Eisen, 61 (1941), p. 852/60. <sup>15</sup> Arch. Eisenhütt., 15 (1941/42), No.

TABLE II

Composition, Tensile Properties, Magnetic Saturation and Structure of Chrome Nickel Steel Samples With About 0.15 Per Cent and 0.25 Per Cent Nitrogen, After Water Quenching from 1100 Deg. C. (2012 Deg. F.) to Establish the Austenite-Ferrite Area in the Structure of the Chrome-Nickel Steels

Steel No.	C Per Cent	Cr Per Cent	Ni Per Cent	N <sub>2</sub> Per Cent	Yield Limit Lb. Per Sq. In.	Tensile Strength Lb. Per Sq. In.	Elonga- tion L=10D, Per Cent	Reduc- tion in Area Per Cent	Impact * Strength Ft-Lb. Per Sq. In.	Magnetic Saturation 4π∫00 Gauss	STRUCTURE		
											Austenite Per Cent	Ferrite Per Cent	Other Per Cent
13 14 15 16 17	0.09 0.12 0.10 0.08 0.14	19.23 18.75 18.25 18.23 19.17	2.39 3.08 3.87 5.49 6.42	0.148 0.159 0.141 0.153 0.162	149,000 130,000 111,000 51,000 49,000	200,000 181,000 165,000 126,000 108,000	3.8 9.2 16.2 40.1 44.6	6.2 15.3 21.1 49.6 46.3	17.4 24.6 48.5 132.4 177.2	11,960 12,350 8,920 820 430	100	25 5	Mart. Mart. Mart.
18 19 20 21 22 23	0.12 0.10 0.09 0.14 0.12 0.10	20.98 20.70 21.05 20.21 20.76 20.33	1.54 2.32 3.37 4.85 6.22 6.79	0.150 0.144 0.137 0.141 0.153 0.147	69,000 69,500 72,000 63,000 60,000 58,000	118,000 124,000 118,000 111,000 110,000 107,000	40.0 42.6 46.5 47.2 43.8 44.7	52.4 57.7 65.2 68.7 63.9 69.2	127.3 147.6 167.8 146.1 175.8 172.2	6.780 3,970 2,740 1,620 620 90	50 70 80 90 95 100	50 30 20 10 5	
24 25 26 27 28 29 30 31 32	0.13 0.14 0.11 0.15 0.13 0.12 0.11 0.13 0.09	24.36 25.03 24.99 24.26 24.48 24.32 24.78 24.02 24.32	1.21 2.38 3.32 4.57 7.10 10.75 12.22 12.52 13.17	0.153 0.150 0.144 0.142 0.134 0.137 0.162 0.143 0.138	70,500 89,000 90,500 85,000 85,500 85,500 69,500 66,000 67,000	105,000 105,000 109,000 109,000 110,000 113,000 107,000 104,000	22.2 23.0 25.8 27.2 34.2 33.4 36.6 38.6 35.2	55.0 60.0 59.0 61.5 60.7 59.3 58.5 61.8 59.7	17.4 34.0 98.4 128.0 134.5 140.3 154.1 167.8 172.2	8,680 7,540 6,320 4,630 3,080 2,060 950 110 80	30 45 55 65 80 90 95 100	70 55 45 35 20 10 5 0	
33 34 35 36 37	0.13 0.08 0.11 0.09 0.09	20.66 20.78 20.58 20.13 20.03	1.42 2.32 3.31 4.61 5.71	0.248 0.235 0.262 0.255 0.243	70,500 69,000 62,000 63,000 59,000	120,000 124,000 123,000 111,500 108,500	40.0 41.4 44.0 42.0 41.7	52.4 54.8 56.4 56.7 53.9	164.2 160.6 169.3 179.4 159.9	4,030 3,410 1,430 580 70	70 80 90 95 100	30 20 10 5	
38 39 40 41 42 43 44	0.12 0.11 0.11 0.11 0.13 0.13	25.08 24.96 24.96 25.38 24.39 24.92 25.03	1.42 2.35 2.32 4.66 7.34 9.53 12.01	0.261 0.259 0.268 0.253 0.239 0.246 0.251	74,000 89,000 89,000 87,000 89,000 82,000 69,000	103,000 114,000 118,000 118,000 118,000 116,000 110,000	19.0 27.0 28.5 30.0 32.2 34.4 33.6	51.0 60.3 62.8 61.5 60.4 58.2 59.7	15.2 68.0 85.4 118.6 128.8 149.0 157.7	9,720 6,660 5,680 4,010 2,730 1,890	25 45 60 70 80 90	75 55 40 30 20 10	

\* SAMPLE: 10x10x55 mm., NOTCH = 3 mm. x 2 mm. diameter.

peratures of 1110, 1290, 1470 deg. F. and sometimes 1650 deg. F. a certain amount of embrittlement will take place. At these temperatures the 750 to 930 deg. F. range can no longer have any influence, also no transformation of the austenite into martensite can take place since the magnetic saturation curves do not increase. The magnetic saturation even decreases slightly after protracted annealing between 1110 and 1470 deg. F. It is, therefore, very likely that the decrease in toughness after a 100-hr. annealing in the temperature range between 1110 and 1470 deg. F. is due to a precipitation of the non-magnetic iron-chrome compound.

These results show that the tendency towards embrittlement of austenitic-ferritic chrome-nickel-nitrogen steels after protracted heating at elevated temperatures is practically the same as in the austenitic-ferritic chrome-nickel steels without nitrogen.

Since the tendency towards embrittlement is more pronounced in austenitic - ferritic chrome - nickel-nitrogen steels after annealing at elevated temperatures than in the purely austenitic chrome - nickel - nitrogen steels, the use of purely austenitic chrome-nickel-nitrogen steels as rust and corrosion resistant material is recommended, if temperatures stresses above 570 deg. F. occur.

Also in the heat-resistant chromenickel steels, a part of the nickel can be replaced by nitrogen. Scale resistance is not reduced, as seen in Fig. 7.

These heat resistant nitrogen-bearing chrome-nickel or chrome-nickel-silicon steels are purely austenitic. Only so much nickel is replaced by nitrogen that a purely austenitic structure is still warranted for reasons stated above. From the scale loss curves it can be seen that the

nitrogen bearing austenitic chromenickel or chrome-nickel-silicon steels have a slightly better performance in spite of their lower nickel contents than the well-known heat resistant steel with 25 per cent chrome, 20 per cent nickel and 2 per cent silicon. Especially good was the steel containing 21.5 per cent chrome, 12.5 per cent nickel, 1.5 per cent silicon and 0.20 per cent nitrogen, which can be produced comparatively easily and which is somewhat superior to the 25-20-2 steel mentioned. It must be pointed out that such a chrome-nickel-silicon-nitrogen steel tends much less towards embrittlement at temperatures between 1110 and 1650 deg. F. It was shown that a loss in impact strength of only about 50 per cent occurred after a 100-hr. annealing at 1470 deg. F., while the 25-20-2 steel experiences an 85 per cent decrease after a similar treatment.

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# Diesel Gas Engine Cuts Fuel Consumption 25 Per Cent

AN entirely new development in the diesel engine field, which will permit use of either gas or oil as fuel without any electrical sparking device, and which will cut fuel consumption of gas engines from 20 to 25 per cent, has been revealed by the Cooper-Bessemer Corp. The result of experimentation which began in 1927, this development enables the unit to operate on a wide variety of fuels including fuel oil, natural gas, manufactured and coke oven gases, sewage gas and refinery by-products.

The conversion from liquid to gas fuel can be made with the engine operating continuously at full load. Heretofore, in changing from one fuel to another, it has always been necessary to exchange major or minor parts of the

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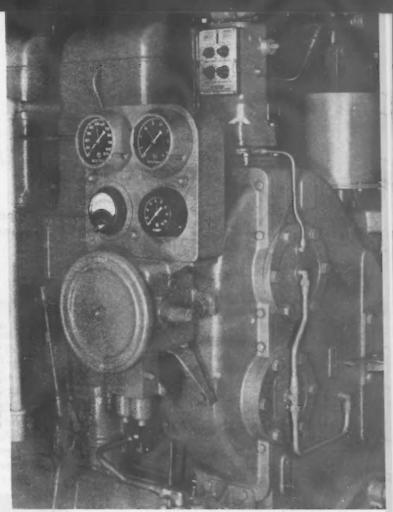
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The usual 4-cycle gas engine operates on the same general principle as the better known 4-cycle gasoline engine. The ratio of gas and air is held constant and the quantity of the mixture is varied in accordance with the load demand by throttling the intake. At full load the compression pressure ranges from about 90 to 125 lb. per sq. in., depending upon the quality of gas. Ignition is always by means of spark. Two-cycle gaseous-fuel engines operate on the same principle, except that the air quantity is constant, while the gas is varied, producing a variable mixture.

The thermal efficiency of an internal combustion engine is a function of its compression pressure. For example, a 125-lb. compression engine usually results in a heat economy of about 10,000 B.t.u. per brake hp.-hr., while a 400-lb. compression engine usually has a heat economy of about 7500 B.t.u. per brake hp.-hr. On the Otto cycle engine, the compression must be held to the point where there is no danger of the mixture being ignited before the proper time, which limits its efficiency.

In 1927, Cooper-Bessemer had the idea of burning gas on the diesel cycle. Since it was assumed that there was no chance of compressing the mixture

V IEW of the control end of a Cooper-Bessemer type JS-8 diesel engine showing the gasoil operating mechanism. This engine is rated 675 hp. at 400 r.p.m.



By RALPH L. BOYER
Chief Engineer, Cooper-Bessemer Corp.,
Mount Vernon, Ohio

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to 400 lb. for the diesel cycle, arrangements were made to compress air only and then inject the gas on top dead center under 1000 lb. pressure. While it was possible to run a single cylinder test engine without any other ignition means, the engine performed much better if pilot oil injection was also used.

Since that time at least one other engine builder has taken up this development and has built and installed a number of large engines.

No thought was given at that time to the possibility of allowing the gas to go in with the intake air, because of the assumption that it would preignite. Actually, it is difficult to get gas to ignite at 400 lb. compression. Theoretically, at least, the temperature of ignition of a perfect mixture of natural gas and air is above the temperature reached with 400 lb. compression, and there is a minimum gasair ratio below which the mixture is not inflammable under atmospheric conditions, even when ignited with a spark. The point that was overlooked earlier was that due to the inherent efficiency of the diesel cycle the amount of gas required is considerably less than with the Otto cycle and the gasair ratio at full load is still a very lean mixture, not too easily ignited.

Recently, it was found possible to admit the gas with the engine air intake and still be completely free of any evidence of premature ignition. In fact, on very heavy overloads with natural gas, the mixture will not fire without a pilot oil flame. Use of the latter is made attractive by the desirability of having an engine which can operate on either oil or gas.

Assuming a diesel oil engine in operation, if gas is admitted in the intake air the governor will immediately reduce the amount of oil to compensate for the energy being supplied by the gas. It then merely becomes necessary to reduce the fuel oil injection to the desired minimum and govern the percentage of gas according to load. To convert the oil engine to the gas engine it is, therefore, merely necessary to remove the fuel oil system from the governor, set it in the minimum position and connect the governor to the gas regulating valve. This can be done in a few minutes.

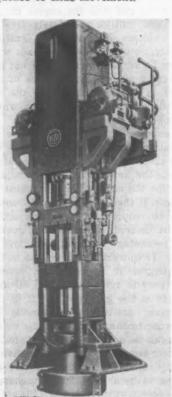
There are cases where the gas availability varies frequently and it is desirable to be able to instantly change (CONTINUED ON PAGE 112)

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### Presses

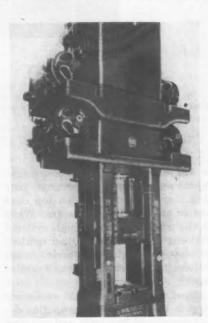
... Recent developments in hydraulic and mechanical presses, forming and bending machines and shears are described in the following pages.

200-TON press designed for pressing deep sections and also flanged objects of powdered metals where one portion of the work must be pressed at a different speed than another has been announced by E. W. Bliss Co., 53rd Street and Second Avenue, Brooklyn 32. The presses feature independent pressure control, stroke control and speed control of top and bottom slides. Separate pumping units are furnished for each slide so that the relation of speeds of the two slides can be infinitely varied to suit a wide variety of work. presses are available in capacities ranging from 50 to 5000 tons. The 200-ton model is illustrated. Optional features include automatic loading devices and core rods for bushing work. The presses have electric control permitting the required sequence to be readily changed should a different type of work require a different sequence of slide movement.



### 500 Ton Nosing Press

A HIGH speed hydro-dynamic press of 500-ton capacity has been developed by E. W. Bliss Co., 53rd Street and 2nd Avenue, Brooklyn 32, especially for nosing 8-in. shell. The press is equipped with a 400 hp. pumping unit providing a 5½ sec. pressing cycle. To aid fast operation, the reversal is controlled by four-way valves of special design which permit a fast yet shockless reversal. Stroke

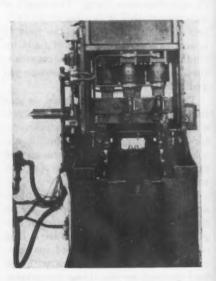


of the press is 24 in. Closing speed is 600 in. per min., pressing, 190 in., with reversal at 650 in. per min.

### Special Purpose Press

A MACHINE for pressing and staking wedge pins in place on the T-66 track shoe has been announced by Hydraulic Machinery, Inc., 12825 Ford Road, Dearborn, Mich. The machine is hydraulically operated, with cycle arranged for automatic or semi-automatic control. After the shoes are assembled in sections of ten, they enter the part of the machine

where the pins are manually inserted with the section taking its normal contour on the machine bed. A complete cycle takes place in 21 sec. Each of the four cylinders which actuate the rams has a capacity of 35 tons



or a combined rating of 140 tons. The power unit is installed adjacent to the press and contains pumps, motor, oil pressure reservoirs and relief valves.

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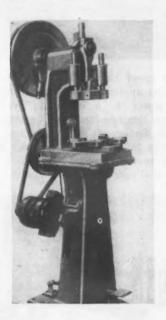
### Bench Punch Press

A HIGH speed precision punch press which can be used as a pipe vise, tensile of compression testing machine or a shear for plate or rounds has been announced by Reimuller Bros. Co., 9400 Belmont Avenue, Franklin Park, Ill. Using V ways to eliminate the use of die shoes, the press is designed for quick and efficient handling of many production jobs. It is made in 5-ton size and has a 5 x 6 in. platen with 7 in. of ram movement.

### Open Face Punch Press

AN all purpose punch press illustrated below, suited to a wide range of small press work has been

announced by Maxant Bauton & Supply Co., 117 South Morgan Street, Chicago 7. The press has a large crosshead and construction is open face to permit quick change of dies for fast setup. Throat height is 10 in., distance of bed to slide is 71/4 in. and stroke is 21/2 in.



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### Pneumatic Die Cushion

COMPOUND pneumatic die cushion now designed in three sizes has been announced by Dayton Rogers Mfg. Co., Minneapolis 7, for use where two independent blank holders are required on a compound banking, piercing and drawing die. The outer piston has maximum diameters of 12, 14 and 16 in. The inner piston has a minimum diameter of 5 in. The outside diameter of the inner piston can be increased or decreased to increase or decrease the draw ring holding pressure of the given compound die. The inner diameter of the outside piston can also be increased or decreased relative to the required draw ring holdng pressure required on a given die, compensating for a constant air pressure on the pneumatic die cushion cylinder itself.

### Radius Forming Brake

A RADIUS brake capable of forming duraluminum, chrome molybdenum, rust resistant and spring tempered alloys and other low ductile materials used in the fabrication of aircraft components has, been announced by O'Neil-Irwin Mfg. Co., Minneapolis 15. Accuracy is guaranteed to a tolerance of 0.001 in. in all duplicated work. All contact sur-

faces of the Di-Acro radius brake are adjustable in all planes and angles, making it possible to obtain a true radius over the entire material width at the point of forming, regardless of



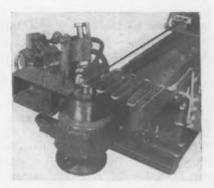
the degree of angularity. Maximum folding width is 12 in. Standard forming plates have radii form 1/16 to 3/16 in. in 1/32 in. steps.

### Motorized Press

HYDRAULICALLY controlled Reimuller hy-speed gap style 10 and 20 ton motorized presses have been announced by Reimuller Brothers Co., 9400 Belmont Avenue, Franklin Park, Ill. A hand lever hydraulic valve controls the ram movement through feed, hold or return position. Other features include a hollow large area ram for holding punches and other fixtures, lapped ram, packless design, twin pressure gages showing pressure tons. The stroke of the ram is 12 in. A motor driven hydraulic pump furnishes 1% gal. oil per min. to the ram giving 1.5 in per sec. ram speed in the 10 ton and 0.8 in. per sec. for the 20 ton. The 10 ton furnishes four complete stroke per min. and the 20 ton furnishes two. The motor drive unit can be purchased separately equipped with a table to be used for testing hydraulic equipment or as a hydraulic test bench and furnishes up to 4500 lb. pressure per sq. in.

### Automatic Tube Bender

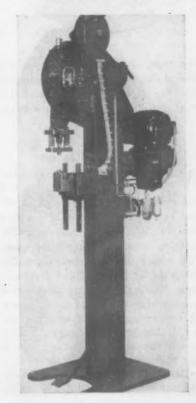
A SMALL size, high speed, full automatic bender for handling tubing up to 1 in. o.d., such as used in metal furniture and refrigeration applications, has been developed by Pines Engineering Co., Aurora, Ill. When equipped with a multiple angle selector, the bender will makeup to 50 tubular chairs per hr. with 8 bends in each chair. A special adaptation has been developed for making serpentine



coils. It incorporates the Pines booster attachment for automatically advancing the coil to position for the next bend. Through momentary contact of the start button, the bender completes the entire cycle and returns to starting position, including automatic ejection.

### Pail Ear Riveter

N electrically powered T-J Rivitor specially adapted to the job of piercing, dimpling and riveting bail ears on pails using 134 lb. tinners rivets has been announced by Tomkins-Johnson Co., Jackson, Mich. Rivets are underfed by the machine, as on a standard underfeed Rivitor. The unpierced pail and ear are placed over the rivet and properly located by gages. When the ram descends, a combination piercing and dimpling die mounted on a spring-actuated pressure pad attached to the ram forces the work over the rivet, piercing and forming a dimple in the pail and ear.

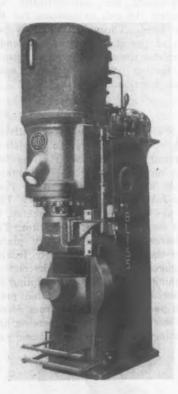


THE IRON AGE, March 29, 1945-63

At the end of the down stroke, the rivet set forms a slightly rounded head on the rivet.

### Hydraulic Horn Press

A HORN press embodying the hydro-dynamic press principles has been developed by E. W. Bliss Co., 53rd Street and Second Avenue, Brooklyn 32. The 300-ton press is one of a line of gap type presses ranging in capacity from 50 to 500 tons. Presses are available in the



horn type, illustrated, table type for general shop work, and extended table type for straightening work. Hydraulic cushions in the bid are available, if desired.

### Open End Bar Shears

LINE of open-end vertical bar shears designed in 10 sizes and with ram pressures of from 25 to 300 tons has been announced by Thomas Machine Mfg. Co., Pittsburgh, Pa. Shearing capacities for rounds range from 1 to 3 in. The shears are also adaptable for punching and plate and angle shearing. The ram is machined for attaching various types of punching tool arrangements, including single, double or triple gagged units, cluster punches or a floating punch. The multiple jaw type clutch has a positive automatic kickout for stopping the ram at the top of the stroke.

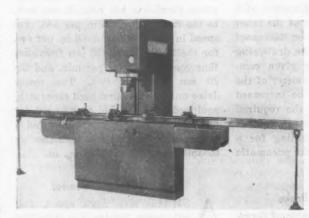
The flywheel is mounted in roller bearings located within the frame for safety and to eliminate overhung load on bearings. A V-belt motor drive reduces shock load on the motor.

### Drawing and Annealing Compound

DRY drawing and annealing compound, No. 268, that is applied as a waxy aqueous emulsion has been announced by Plasteel Corp., 3900 West Jefferson Avenue, Ecorse 18, Mich. Applied in varying strengths to give a nearly imperceptible wax coating in the deep drawing of brass and steel, the compound is applied in either a drum or spray type mechanical washing machine at an operating temperature of 175 to 185 deg. F. The coating is said to contain sufficient annealing compound to prevent the formation of hard mill scale during anneal but will produce a thin porous protective scale that is easily removed in subsequent pickling leaving a clean, scale-free piece.

### Straightening Press

A LINE of hydraulically operated straightening presses has been announced by Colonial Broach Co., Box 37, Harper Station, Detroit 13. The presses are designed for straightening both finished and rough work. A pressure gage mounted on the head of the machine in front of the operator indicates the exact pressure being applied to the workpiece. Machines are available in a number of capacity ratings ranging up to 60 ton.



### Foot Pump

A TWO-SPEED foot pump for pressures up to 10,000 lb. per sq. in. has been announced by Leon-Raymond Corp., 2023 Madison Street, Greene, N. Y. The pump has an automatic change speed feature. It has two pistons, one a high speed, low pressure piston, the other a small,



slow speed high pressure piston. A typical application is the furnishing of power to a hydraulic cylinder where the ram must be extended a large portion of its total travel before it contacts the work and then high pressure must be applied for the final operation.



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### Hydraulic Rams

SING 4200 lb. per sq. in. as the basic pressure, a complete range of lightweight steel rams have been announced by Reimuller Brothers Co., 9400 West Belmont Avenue, Franklin Park, Ill. Sizes available vary from ½ to 6 in. in diameter. They supply forces, if used with standard foot

power units or motor driven pumps and valves manufactured by this company, of from 500 lb. to 40 ton.

### Plastic Mold Bases

A LARGER sized set of prefabricated parts for plastic mold bases, known as the 55-S series, 23½ in. long and 12 in. wide, has been announced by Detroit Mold Engineering

Co., Detroit. All surfaces of the cavity retainer plates are ground and the leader pins and bushings are installed. The other parts are maintained to close tolerances. Sprue bushing, return pins, dowels and screws of proper length and size are furnished with the set.

64-THE IRON AGE, March 29, 1945

# WORKABLE! Electric Welded Steel Tube by REVERE

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These shapes are just a few of the thousands that have been made of Revere Electric Welded Steel Tube. It is so workable that a great number of parts and products can be made of it. Here are some of the operations customarily performed on these tubes:

Expand Plate
Flange Flatten
Bend Taper
Bead Swage
Machine Grind

Weld

Revere Electric Welded Steel Tube is not just tube. It is available in various exactly-controlled hardnesses, and not only round but in almost any desired shape. It can be supplied in various tempers, annealed or normalized, as required. Dimensional tolerances are held to strict standards. We can so process the tube that it is impossible to ascertain the location of the weld. There is literally a Revere Welded Steel Tube for every steel tube use. Sizes up to 4½ inches O.D., wall thickness up to #7 B.W.G., .180 inch.

We not only supply steel tube in straight lengths, but also fabricate it into parts that will fit into your assembly with little or no additional processing. One customer reports saving \$9 per unit when he switched to Revere Electric Welded Steel Tube. For further information write the Revere Executive Offices.

# REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801 Executive Offices: 230 Park Ave., New York 17, N. Y.



• Detroit's long-term future as a center for jobs is optimistically outlined, but planning takes no account of industry's aversion to further expansion in a labor storm center.



ETROIT—A glimpse into Detroit's future employment prospects is afforded in a new study, completed after a year's work, released last week by the City Plan Commission. For the near term the study is somewhat pessimistic about prospects, but it becomes bravely optimistic for the future by predicting a greater number of jobs in the area than ever before.

In the postwar period it is expected that Wayne County (Detroit) and thin adjoining strips of populated territory will provide jobs for 1,000,000 to 1,200,000. These expectations are considerably higher than prewar standards; in 1940 there were about 887,000 persons employed, on an average.

But this postwar expansion is tempered by the fact that the labor force existing in the area will run from 1,100,000 to 1,300,000 persons, as compared with 1,400,000 or so in 1940. There can be expected after the war, therefore, an unemployment total of around 150,000, and the deficiency may rise as high as 300,000.

The commission study strongly recommends diversification of the city's industry, pointing out that today about four-fifths of it lies in the automotive sphere. Plastic and chemical products, aviation, prefabricated housing, rubber, and glass are noted as opportunities for industrial expansion. That broad scale expansion is anticipated for the long term is in-

dicated by the rather optimistic expectation of the report that by 1970 there will be from 1,000,000 to 1,200,000 jobs in manufacturing alone in the area, plus 520,000 to 610,000 in non-manufacturing, and 30,000 to 35,000 in other fields—an aggregate of 1,550,000 to 1,845,000.

There is some serious doubt whether this state of affairs will ever come to pass, and the doubt is tied up to the recurrent belief that the automotive industry has embarked on a program of decentralization which will shift its weight out of Detroit, even though its center of gravity remains there. Certainly it is true that many industrialists are making no secret today of their intentions to do their expanding elsewhere as long as the Detroit labor situation remains as it has been. If that point of view prevails as strongly as it has been indicated as doing, Detroit may become something like Akron-retentive of the industry it already has, but seeing new plants in its special field grow up elsewhere.

Interesting enough, Detroit's future as a center of employment may be

aided by the same union aggressive mess which now casts a blight ove it. For if the organizing of the mas industries so successfully carried out by the CIO unions continues into the byways of America, then paralles situations elsewhere might restrain industrialists from moving away from the thorns which now prid them in Detroit. And wage differentials, too, might be reduced to a point where necessary expenses of decentralization—transport between point for example—would overweigh them.

THE efforts of the UAW to was out the area bracket system which is a keynote of War Labe Board policy, bear on Detroit's problem also. The campaign to eliminate area brackets (under which new job rates are pegged to existing community levels) began in earnest washington last week in hearing which postscripted the recent Mean committee sessions here.

Walter Reuther of the UAW urge the adoption of one of his union favored planks, equal pay for equi work, regardless of where it is done

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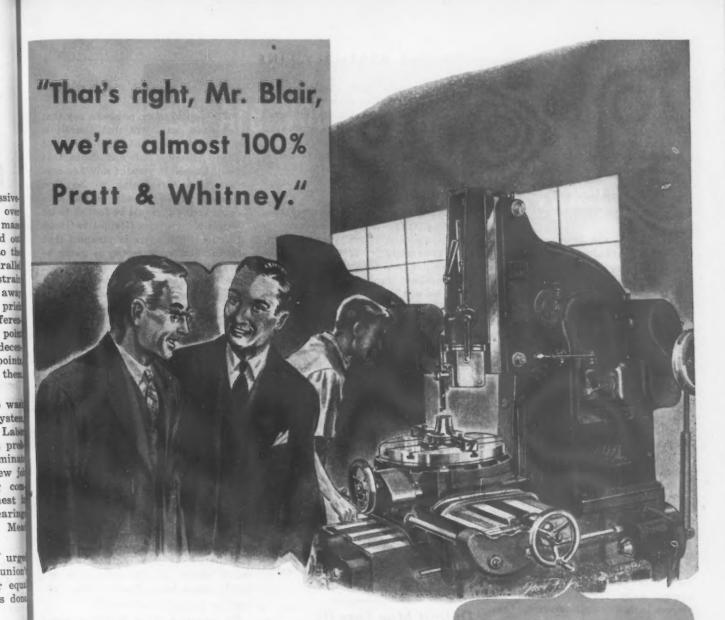
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SKID PREVENTIVE: Ordnance technicians weld non-skid teeth on tank treads and also fasten "ducks" on sides of treads of a 4th Armored Division tank to avoid accidents on icy highways near Bastogne, Belgium.





This is happening over and over again. The name Pratt & Whitney on toolroom equipment spells quality to buyers of production tools. Manufacturers looking for tools, dies, jigs, and fixtures will invariably lean toward the shop with Pratt & Whitney precision equipment.

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It is perfectly logical. The better-equipped a tool shop is, the finer quality and accuracy it can produce. For better than 85 years, Pratt & Whitney machine tools, small tools, and gages have proved that there is no substitute for quality . . . that there is no better paying investment than the right tools for the job.

Whether you need new tools, dies, or fixtures now, or are laying your plans for later reconversion, you will be wise to deal with a shop that insists on using Pratt & Whitney equipment. You have every reason to expect finer quality . . . and chances are that you will get faster delivery.

"Handiest machine in the shop"...
The Pratt & Whitney Vertical Shaper machines hard-to-reach surfaces and hosses without special tools... will tackle all sorts of irregular shapes... is indispensable in any toolroom. For full information on this and other PaW products write Pratt & Whitney direct. The precision, long life, and dependability of PaW equipment always pays dividends to the tool shop owner and his customers.

### PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT



He claimed that a new General Motors plant at Bedford, Ind., for instance, pays as much as 43c. below the top corporation scale for similar work, and that Grand Rapids Diesel Division jobs are 20c. or so under Detroit-Flint levels for the same classifications. Mr. Reuther said frankly that Detroit will suffer if the area brackets were continued after the war.

Of course, the Reuther argument can be regarded as simply another means of moving wages to higher levels. Once Bedford rates, for instance, were adjusted to those of Detroit, the stage would be set for labor to point out that costs of living in the metropolis are far above those in a small Indiana town, and that in the interests of equity, therefore, the Detroit workers deserve a premium. This is the kind of a circle in which prewar UAW arguments ran, using one company as a standard of pay rates until its levels were exceeded by another, then using the second's rates as a reason for demanding advances from the first.

ONG term pay principles of another sort exposed by the UAW are being pondered in New York by a War Labor Board panel considering demands made on Bendix Aviation Corp. Aside from the customary call for blanket raises, the question of an annual wage for hourly paid employees is up for consideration.

The UAW has introduced a formula in this case for determining the guarantee a company would make to a worker. It consists of multiplying by 40 (the number of hours in a normal work-week) the straight time average hourly rate of each employee for the year, preceding the effective date of the plan. Probationary employees would have their minimum weekly rates determined by multiplying the straight time average hourly rate of earnings for the first three months of employment by 40. Should the general wage adjustment sought by the union be awarded the employees, that amount, on a 40-hr. basis, would be added.

For each week during the life of the plan that the employee, for reasons beyond his control, does not receive a sum equal to the minimum amount, Bendix would make up the difference.

Bendix Aviation officials objected to the plan as too expensive, and stated that the employment situation is too complicated and too uncertain to guarantee a year's employment to any large number of employees. A company statement said "that it would cost four or five times the amount of present profit after taxes" and reported further that it appeared that the cost of the plan might amount to more than the present value of all the Bendix plants.

Annual wages have been sought by UAW-CIO for several years, but have not made any headway whatsoever. The general retort of the automotive people has been that, "When they can tell us how many cars we can sell, then we will be able to guarantee them a set number of jobs."

It is interesting to note that the auto workers' presentation leans in part toward the justification for its stand on the fact that many war producer companies have excess profit credits with the treasury which will guarantee them at least a stated percentage of their invested capital. The union also points out that recently built plants can be written off over a five year period instead of the normal 20 years, making it possible to further strengthen corporate financial positions. On the basis of these tax provisions, the union stated that it "is simply asking that Bendix Aviation Corp., which has received such solid guarantees from the U.S. Government, share this guarantee with its employees."

## Detroit May Lose Its Critical Labor Status

Washington

• • • Detroit and coastal shipbuilding centers may become Group II labor areas within the next month if the War Manpower Commission yields to continuing pressure from labor and industry groups. Included in the shipbuilding group are: Los Angeles, San Francisco, Portland, Ore., Baltimore, and Norfolk, Va.

This was foreshadowed by the statement of WMC Chairman Paul V. McNutt at the March 20 meeting of WPB, when he said that in his opinion Detroit's classification as a Group I area should be changed.

Mr. McNutt's belief coincides with the statement made by George Romney, head of the Automotive Council for War Production, at hearings conducted by the Mead (Senate) Committee last month. Mr. Romney declared that there were 20,000 out of work in Detroit and advertising that Detroit is a Group I area is misleading.

WMC spokesmen, however, say that they have not heard that Detroit is about to be removed from the most critical classification and doubt that it will happen in view of military contracts that are going to be soon added to those already in the auto center area. It would be foolish to let Detroit bounce from Group I to Group II and back, if there is prospect that a great deal more money is going to be spent by the Army which would have the effect of absorbing temporary labor surpluses, it was pointed out.

Meanwhile, the Mead Committee said on March 21 that WMC has agreed to review the criteria by which cities and areas are classified into the various labor groups according to their manpower shortages. The latest WMC survey shows that Detroit has a shortage of 1800 workers of different skills. It is believed that if WMC area criteria are revised, the new ones will distinguish between areas whose need is for a limited number of employees with designated skills and those areas where there is a great general shortage.

It is understood that the Byrnes office is considering recommending the cancellation of some battleship contracts which call for completion in 1947. Naval losses have not been as high as originally estimated.

The bumping of the Maritime Commission's expected increased program for the last half of the year may result in the lay-off of more than 150,000 shipyard workers in coastal cities, even if Maritime and Navy manpower requirements for a stepped-up repair program are considered. This is the expectation of the WMC, WPB, and the Maritime Commission and the agencies hope to soon institute a program for the recruitment of workers from the yards to work in other war industries.

The recruitment plan involves the pushing back of Maritime ship completion dates and the hiring of the more efficient workers away from the yards, rather than accepting the less efficient ones which would normally be laid-off first by the shipbuilding companies. Employment ceilings would be imposed under a scheme resembling the Allentown Plan and workers would not be discharged until there was a new job in a city having adequate housing and transportation facilities.







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Here is an on-the-job story of how Carpenter Stainless Strip and the

practical knowledge of a Carpenter representative teamed up to overcome production difficulties and lower costs in making Stainless parts.

The inside diameter of the typewriter key rims shown above had to be formed exactly to size so that they fit tightly over the keys. Sharp corners at the base of the tab were essential, since if the tabs were not properly stretched or drawn, the bend would come at a point below where the tab joins the rim. This would have made it impossible to secure a tight fit.

Recommendations of the Carpenter representative helped solve the shop difficulties. And here's what the manufacturer gained by using Carpenter Stainless Strip: 1. Because Carpenter supplied Stainless Strip in long coils to very close tolerances, it permitted faster and more economical manufacture than was possible with the metal previously used. 2. A change-over from non-ferrous metals to Carpenter Stainless Strip also made possible a saving in initial cost of the material because Stainless was 12% lighter in weight. 3. And further, Carpenter Stainless Strip was less costly to ball burnish to bring out the gleaming finish on the part.

It will pay you to investigate the possibilities of applying ductile, easyworking Carpenter Stainless Strip to your new or redesigned products. Your nearby Carpenter representative will be glad to stop in and discuss with you ways of getting the most from this versatile Stainless Strip.

The Carpenter Steel Company - 121 W. Bern Street • Reading, Pa.

# Carpenter STAINLESS STEELS



BRANCHES AT

Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia



# Washington . . . L. W. MOFFETT

Administration reconversion plans said to be better than those thrown out to industry last Fall... Mr. Krug says plans announced before the election last Fall would still be good after VE-Day.



ASHINGTON—Present administration reconversion plans are said to be better than those thrown out to industry last Fall now that there seems to be a streak of dawn in the long night of war in Europe.

WPB Chairman J. A. Krug said this in his press conference on March 15 and he also said that the plans announced before presidential election would still be good after VE-Day.

What this means is that the overall cutback will be a minimum of about 40 per cent and controls will be dropped in rapid order, as soon as possible. The fact that Mr. Krug can say this now means that the administration has a rational viewpoint which has been distorted from time to time by an overplayed game of psychological warfare to convince the American people of the horrors of war.

One high-ranking WPB official told THE IRON AGE recently that citizens do not have to be hit over the head with publicity designed to scare them into supporting the war. He said that the only thing the government has to do is to ask the people to do the things the government decides are needed and that the people can be depended upon to cooperate.

Mr. Krug has asserted that the War and Navy Departments have no intention of wasting billions of dollars of the taxpayers money by leaving a great deal of war material in Eu-

rope, and that WPB foreign representatives have reported aggressive reclamation and reconditioning programs abroad under the sponsorship of the War Department. Nevertheless, there has been so much discussion about reequipping the Army for the Pacific War, that it is expected that Congressional investigating committees will send men to the continent to see to it that this does not happen.

Mr. Krug is accurate in stating that WPB has reconversion plans, but the thing he did not mention is that there has not been the industry consultation that will be necessary to effect this reconversion. It is true that the Army and Navy have talked with various segments of munitions producing industry about terminations, but there has not been the degree of consultation needed to finally reduce controls to the point where civilian production on a prewar scale will be possible.

Furthermore, the military policy of clamping down upon attempts by the RFC to publicize machine tools that may be available for reconversion purposes is said to have adversely effected sales.

If 38 to 40 per cent of war contracts is finally cut after VE-Day, it is expected by WPB that it will take four to six months before the slash becomes fully effective. The War Department plans to continue aircraft contracts at the same rate for the Pacific War that is now in effect for the two wars.

The reason for this is the de-emphasis of short range fighters and the anticipated need for fighter bombers of fairly long range and heavy bombers needed to carry a tougher airwar against Japan.

Meanwhile, about 2,000,000 troops will be moved, via the United States

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ROCKET AS-SIST: British Seafires are now using rocket assist tubes, on both sides of the fuselage, to shorten the takeoff run. The cordite charge furnishes additional acceleration at the end of the run.

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# ASK THE "BASIC" MAN YOUR \$64 QUESTIONS

ALWAYS ready to help you, the Basic Sales Engineer who calls on you invites your questions. He may not know all the answers, but he is in position to help you find them . . . if it's a furnace refractory problem that's bothering you.

Basic Refractories' service is broadening steadily, the better to serve the steel and metal working industries. Nearly every steel producer knows and has used for years our standard refractories for basic open hearth and basic electric furnaces—hearth refractories for new construction, for major and emergency repairs, for heat-to-heat maintenance. More recently you have been acquainted with Basimix for forge and billet-heating furnaces and with Gunmix products for

the maintenance of vertical side walls of electric and open hearth furnaces, soaking pits and other types of heating furnaces. Other products, too, and practical application methods are under way.

The Basic Sales Engineer's job is to help you use these products more effectively ... not only in the usual, long-established ways, but also to meet the more difficult, unusual situations. He has a wealth of knowledge and experience in refractories to place at your disposal, and even more important from your standpoint, perhaps, he is a practical steel man. He has spent years actually making steel.

So don't hesitate to take advantage of the "Basic" man's desire to help you in any way he can. Ask him your \$64 questions.



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BASIC REFRACTORIES, INCORPORATED Cleveland 15, Ohio

perhaps to the Pacific War. This means that only about 1,500,000 of the European soldiers will have any chance of being discharged and under present plans this will take approximately a year. About 3,000,000 workers will be affected by cutbacks after Germany falls.

The President has asked War Mobilizer James F. Byrnes' Advisory Committee to study the possibilities of the guaranteed annual wage. This committee is composed of the following: O. Max Gardner, former Governor of North Carolina, chairman; Eric Johnston, president of the United States Chamber of Commerce; CIO President Philip Murray; Albert Goss, master of the National Grange and Mrs. Anna Rosenberg, New York Regional Director for WMC.

While WLB turned USWA down in the Little Steel case on the question of the guaranteed annual wage, the board recommended to the President that a study be undertaken embracing all industries and businesses.

While the seasonal character of the steel industry was recognized and the impossibility of predicting the nature of consumer demand or operating rate was conceded by WLB, the probability of the guaranteed annual wage becoming a permanent government labor policy should not be discounted.

The OWMR Advisory Committee complained recently that it had not been consulted by Mr. Byrnes about a number of recent moves by the War Mobilizer—referring particularly to the curfew, the brown-out, and the prohibition against horse-racing it is presumed. High administration officials say that this is nothing new, that Mr. Byrnes is a lone operator and consults with no one except Presi-

dential adviser Harry Hopkins and the President himself.

This is regarded as unfortunate by many in highest government positions because Mr. Byrnes' duties with respect to industry and labor and agriculture are particularly responsible, while his experience as a politician has not fitted him especially well for the position he holds.

# Military Orders Are Exempted From Newest Carry-Over Restriction

Washington

• • • Production schedules for orders placed by the military have been exempted by WPB from the carry-over restrictions in CMP Regulation 1 imposed on Class B products, the purpose being to avoid interference in meeting military requirements for construction machinery and equipment. Class B products are in general components as distinguished from military end items but which may be used to produce military requirements.

Previously a deficiency in meeting authorized production schedules for construction equipment considered Class B products could be made up in the succeeding quarter only to the extent of 10 per cent of the previous quarter's authorized schedule.

By amending L-192 WPB has provided that deficiencies in construction machinery and equipment items for the affected agencies—Army, Navy, Maritime Commission, War Shipping Administration—may be made up as if the items were Class A—military end products—that is, in any succeeding month or months.

Also exempted from the carry-over restrictions is production specifically authorized by WPB on Form WPB-1689. Authorization to carry over deficiencies in production schedules will generally be given only when the schedule could not be met on time because of lack of a few components or other interference that can be made up without substantial use of manpower; or when WPB had increased the producer's production schedule of another item that will be correspondingly decreased during the next quarter.

Application for authorization to carry over production should be included with proposed new production on Form WPB-1689.

The exemptions from carry-over restrictions apply to both Schedule A and Schedule B items of Order L-192. Schedule A items may be sold to war agencies without restriction and to other purchasers only on specific WPB authorization (Form WPB-1319). Schedule B items may be sold without restriction.

The amendment of L-192 also clarifies procedure for obtaining emergency automotive repair parts (formerly termed emergency repair parts for engines). Procedure for obtaining repair parts is now identical with that established in L-158 (automotive replacement parts). The emergency certificate is now prepared by the distributor as defined in L-158, instead of by the prospective purchaser, and is filed by the distributor with his producer. The certification may be used only if the distributor does not have the repair part in stock.

THE BULL OF THE WOODS

BY J. R. WILLIAMS



# WHAT IS PLUNGE GRINDING OF THREADS WITH CRUSH DRESSED WHEELS?

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### What are the advantages of ground threads?

Threads can be ground after stock is hardened, eliminating the ill-effects of distortion or surface decarburization from heat treating—especially desirable in the case of tubes and other thin-walled components. Critical thread elements are accurately produced and held concentric with other ground diameters and threaded sections.

### How can threads be ground most quickly?

By plunge grinding with a crush dressed multi-ribbed wheel on the Precision Thread and Form Grinder made by the Sheffield Corporation, Dayton 1, Ohio.

### What is plunge grinding of threads?

It is the production of a full threaded section equal to the width of a crush dressed multi-ribbed wheel in one quick operation of less than two revolutions of the work.

### To what can plunge grinding be compared?

It takes much less time than required with thread hobbing, is far more accurate, and tooling costs are considerably lower.

### Is thread plunge grinding fast?

Definitely yes! The wheel is fed into full depth in 1/3 to 1/2 revolution of the work, and only one additional revolution is required to complete the threaded part. Sections of threads up to 11/4" in length can be quickly produced by plunge grinding on the standard Sheffield Precision Thread and Form Grinder. Special capacity machines are available for other lengths and sizes.

### Does plunge grinding produce threads to an accuracy of class 3 fit?

Unusual uniformity of thread angle, lead and pitch diameter is commercially possible with the Sheffield Precision Thread and Form Grinder especially designed for plunge grinding. Thick first and last threads are eliminated in plunge grinding. On this machine, plunge grinding produces commercial work to not less than a Class 3 Fit accuracy in all cases—and to Class 4 Fit in many.

### How can more information be obtained on plunge grinding?

By writing to the Sheffield Corporation, Dayton 1, Ohio.

• Enterprise Foundry and General Metals, Giannini subsidiaries, ride opposite ends of business seesaw, despite big bank influence... Bay area metal working industry launching a liberal collective industrial relations program.



SAN FRANCISCO — The dubious benefit of having a rich uncle would seem to apply equally to the corporation as to the individual if the Bank of America and the long arm of the Giannini interests constitute an analogy.

In spite of being one of the five largest banks in the world, claiming one out of every four depositors in California, controlling a holding company of no mean potency which owns one of the 25 largest insurance companies in the world, owning-as the man on the street puts it-half the farms in California, in spite of having tentacles reaching into every phase of western industry, manufacturing and commerce-in spite of all this, the Giannini ventures into heavy industry don't seem to show signs of receiving any more favors from the rich uncle than does anyone else.

Transamerica Corp., the Giannini holding company, owns better than 80 per cent of the General Metals Corp. and owns the Enterprise Engine & Foundry Co. outright. General Metals operates gray iron, malleable and steel foundries in both northern and southern California. The firm's prewar business showed no particular advantage from the bank's control. Today neither the name nor power of either the bank or the holding company has prevailed sufficiently to keep the firm from losing 50 per cent of its employees or preventing a 40

per cent decline in volume of business.

Like all West Coast foundries, General Metals has been up to its ears in war contracts for Navy, Army, and Maritime Commission. Similar to most other foundries in this region, volume has gradually declined. Principal reason for the shrinkage is the universal plaint of foundrymen-labor shortage. That the decline is not primarily due to changes in the tempo of the war is indicated by continuing inquiries from war procurement agencies, which the company is obliged to reject. Company officials candidly admit that if they had the men they could take the business, but employment has fallen off ahead of volume.

Cumulative effect of this condition, which has been growing more and more acute during the past year, is evident in the decline in sales volume from \$11,700,000 in 1943 to \$9,600,000 this last year.

Recent volume has been on battle damage, Army ordnance, and heavy truck work. Officials are resigned to a continued loss of employees as the momentum of a large scale push in the Pacific increases and eastern foundries get the first look at new business. One executive summed up the firm's position saying, "Right now we could hardly lay an egg, even if the war depended on it."

A GOOD deal less of a little Lord Fauntleroy is Enterprise, which operates two foundries on the San

Francisco side of the bay. One plant is chiefly concerned with the firm's diesel engine, the backlog of the company's business. The other plant turns out parts, job castings, food processing equipment, and oil burners.

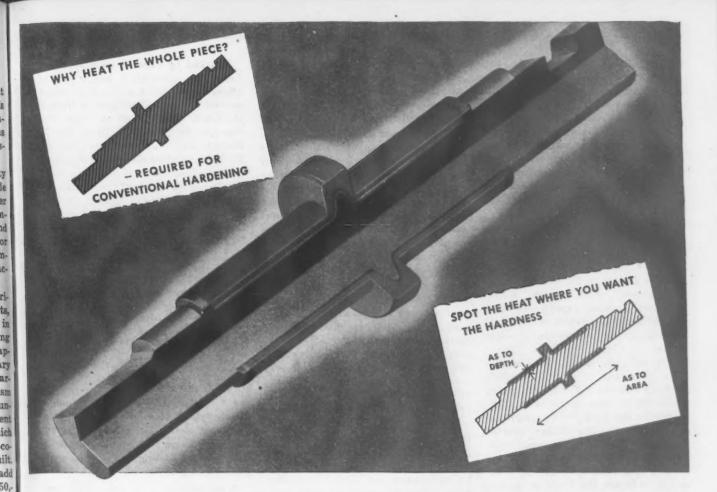
Whether the industry and activity of this firm is in any way attributable to the influence of the bank is rather doubtful. However, in spite of impending completion of Navy and Maritime Commission contracts for diesels, the four divisions of the company are bursting with plans and activity for the future.

In addition to the substantial maritime diesel business the firm expects, great things are also anticipated in the stationary field. The engineering department has a new engine applicable to both marine and stationary with a greatly increased output nearing the production state. Optimism over one of the West's great unknowns stems from a commitment from a western railroad which says that it will buy a western locomotive diesel, if a good one is built. Entry into this market would add substantially to the current \$50. 000,000 western industry-wide volume of which Enterprise gets the largest share.

This organization's international sales department is licking its corporate chops at having jumped the gun on the food processing industry. Deliveries have already been made under lend-lease to Iceland, Russia,

NIGHT FIGHTERS: This huge 240 mm. railway gun is one of several captured by the U.S. Seventh Army on the southern wing of the Western Front. The Germans kept them in tunnels by day and rolled them out for action by night.





# HOW TO CUT COSTS... IMPROVE QUALITY WITH TOCCO LOCALIZED HARDENING

**FAST.** By confining heating to the area subjected to wear . . . and by hardening only the wearing surface, TOCCO Induction Hardening cuts treatment time from hours to seconds.

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SUPER-HARD AND STRONG. Since this localized treatment does not affect the part's core, there need be no compromise between hardness and toughness. It produces super-hardness without reducing previous strength and ductility.

**STRAIGHT.** TOCCO speed minimizes warpage . . . eliminates straightening operations.

**UNIFORM.** Split-second timing of TOCCO'S high-frequency induction heat makes every treatment exactly the same.

**GOOD WORKING CONDITIONS.** TOCCO machine is cool, clean, compact . . . simple for anyone to operate.

THE PART ILLUSTRATED . . . a track roller shaft, 16½" long, for a military bulldozer tractor . . . is TOCCO Hardened at flange and bearings. Flange, 4" diam., is hardened to 50-60 R.C. . . . eight shafts at a time . . . total time, including heating and quenching, 94 sec. or less than 12 sec. per flange, TOCCO machine was designed especially for this application.

Feel free to enlist the TOCCO Engineer in solving your heat treating problems. Write for free copy of "Results with TOCCO."

THE OHIO CRANKSHAFT COMPANY · Cleveland 1, Ohio



INDUCTION

ANNEALING, HEATING

Canada, South America and South Africa. Enterprise turns out entire cannery lines with unit costs running from \$100,000 to \$500,000. Being particularly proud of their fat and oil extraction equipment, they anticipate substantially increased volume in this category for export. Domestically, the bank's wide influence in agricultural industry is expected to have a definite effect on peacetime

Seen as another major development is the company's plan for entry into the domestic oil burner field. San Francisco has long been the headquarters for one of the world's largest manufacturers of oil burners. Enterprise has recruited experienced engineering and sales talent in this field preparatory to aggressive developments.

Informal opinion of industry observers seems to be that Enterprise's interests will not suffer in the export field from its banking connection. Inquiries to the bank from foreign accounts may reasonably be expected to find their way to the proper desk. The vast influence of the bank in the canning and packing fields isn't expected to injure the firm's prospects. As for financing either domestic or industrial installations, the banking relationship may have a distinctly salutary effect.

But like the boy with the rich uncle, it appears to be up to the individual.

ACED with the imminent job of retaining present volume of productive facilities and labor, northern California industry is getting set to strike at the root of the problem.

The California Metal Trades Association, one of the oldest industrial associations in the country, with a present membership of 250 plants in the five counties of the Bay area, has launched a membership drive for the other 50 per cent of the firms in the area, retained industrial relations counsel, and is mapping a program designed to "see whether present industry should stay here or not."

The organization includes metal working and processing firms in the area with the exception of the foundrymen, who have an association of their own. Organized in the late 1880's to advise members on labor relations, the association plans an extension of its activities under pressure of the growing stature of the area as an industrial center.

Representing an entire cross section of industry, the association deals with some 50 different unions. It is set-up

to write master contracts for the industy or to serve individual members on special problems. In the past the association's labor relations record has been spotty at times.

Basic present objective of the association is to expand local industry above the prewar level, to employ more men, and to maintain high wage rates. Most immediate problem of the directors is to determine the scope of the activities to be undertaken. While the membership is increasing rapidly under stimulus of the present activity, officials admit that they are still studying what to study.

Labor and material costs are, of course, the two chief problems which confront any proponent of an industrial West. Current inclination of association members is to let other interested parties concern themselves with the subjects of material and freight rates, and to confine their own activity to so-called "enlightened" industrial relations and to a study of labor costs.

Recognizing the inevitable difficulties attendant to conversion to competitive manufacture, members hope to eliminate the points of friction between industry and labor before they arise. Frankly admitting that their objective is realistic, they are setting up the machinery whereby both parties will have gotten together beforehand and worked out, on a basis of mutual understanding and friendliness, those problems which are going to mean bread and butter to each.

### Cited for Awards

• • The following companies have received awards for outstanding war production:

### Army-Navy "E"

Surface Combustion, Toledo, Ohio.
Eclipse Counterbore Co., Ferndale, Mich. (second star)
Westinghouse Electric & Mfg. Co., Naval Westinghouse Electric & Mfg. Co., Naval Ordnance Plant, Canton, Ohio. Delta Mfg. Co., Milwaukee. (fourth star) William F. Jobbins, Inc., Aurora, 111. (first star)

Doehler Die Casting Co., Pottstown, Pa. (fifth star)
Acme Spinning Co., Plants No. 1 and 2,
Belmont, N. C.

Arteraft Metal Products Co., Fall River, Mass.

Arteraft Metal Products Co., Fall River, Mass. Beaumont Electric Supply Co., Chicago. Chicago Rivet & Machine Co., Bellwood, Ill. O. Hommel Co., Carnegie, Pa. Imperial Plating Co., Brooklyn. Midland Steel Products Co., Parish & Bingham Division, Cleveland.
Mississippi Valley Structural Steel Co., Melrose Park, Ill.
Peerless Chain Co., Winons, Minn.
Standard Products Co., Thermo-Plastics Division, St. Clair, Mich.
U. S. Finishing Co., Sterling, Conn.
Copperweld Steel Co., Glassport, Pa. (third star)

Maritime "M"

Simpson Steel Co., Los Angeles.

Sparked by capable secretary Max Lowe, the association has a set of officers from firms national in scope as well as local. President is George H. Raitt, Steel Tank & Pipe Co; vice-president, J. E. Holland, Pacific Electric Mfg. Corp.; treasurer, George F. Bont, California Steel Products Corp. Directors are: L. W. Delhi, Western Pipe & Steel Co.; Frank B. Drake, Johnson Gear & Mfg. Co.; D. E. Golden, Schlage Lock Co.; Russel Gowans, Western Crown Cork & Seal Co.; P. A. Hoyt, Oliver United Filters Inc.; A. E. McIntyre, Merco-Nordstrom Division, Equitable Meter Co.; Charles E. Moore, Joshua Hendy Iron Works; G. F. Twist, Atlas Imperial Diesel Co.

### Reynolds' Foundry Now in Production

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Springfield, Mass.

• • The former magnesium foundry at Springfield, Mass. purchased by the Reynolds Metals Co. last year, is in full production on aluminum sand castings, die castings and permanent mold castings.

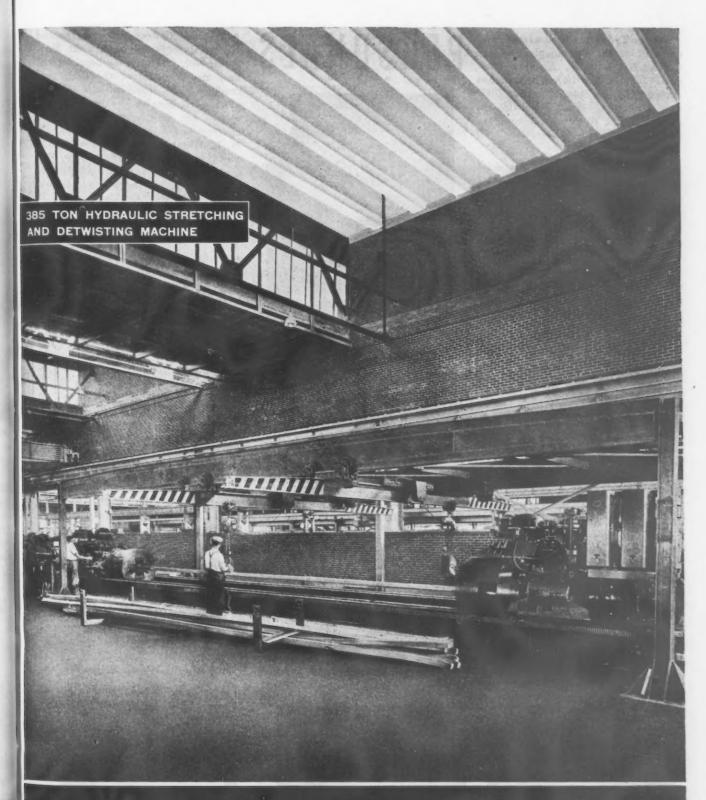
A permanent mold, said to be the largest ever produced, is being prepared for production of the robot bomb warheads here. The mold weighs 18 tons and is 7 ft. high by 7 ft. in diameter. While current production of the foundry is confined to items such as radar cases, cylinder heads and miscellaneous war requirements, postwar plans contemplate a line of castings for washing machines, vacuum cleaners and cooking utensils, among others.

### Aircraft Plant on New Tanks Cleveland

• • • Major parts and assembled sections for the Army's new heavy tank, the T-26 "General Pershing," are being built in Cleveland by Fisher Aircraft Plant No. 1, it was announced recently.

Information as to the type of parts being produced here, or how many men were engaged in the work was not given, but W. S. McLean of the Fisher Body Division, General Motors Corp., said in Detroit that the Cleveland plant was one of the nine Fisher Body units engaged in this work.

The General Pershing tank has thicker armor, a high-velocity 90-mm. gun, torsion bar spring suspension. and improved traction.



# HYDROPRESS INC.

ENGINEERS

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NEW YORK

- Walter Tydon has been named chief engineer of the Buffalo plant of the Curtiss-Wright Corp. Airplane Division. John M. Martin has been named manager of the Subcontracting Division, succeeding W. R. Baldwin, resigned, and L. W. Botts has been appointed to succeed Mr. Martin.
- John E. Ponkow, formerly chief electrical engineer and supervisor of experimental engineering for the Federal Machine & Welder Co., Warren, Ohio, has been appointed sales manager.
- P. N. Love has been appointed manager of industrial relations at the Canton, Ohio, Naval Ordnance plant operated by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
- Charles C. Cheyney, formerly assistant sales manager, has been appointed sales manager of Buffalo Forge Co., Buffalo, N. Y.
- Benjamin Kaplan has been named purchasing agent of the Independent Lock Co., Fitchburg, Mass.
- Michael J. Devaney, for the past four years assistant general superintendent of the South Chicago plant, Carnegie-Illinois Steel Corp., Pittsburgh, has been appointed assistant to the manager of Chicago district operations. Mr. Devaney is succeeded by John H. Vohr, previously assistant to the general superintendent.

# PERSONALS



NICHOLAS GERTEN, managing director, Compagnie Française Blaw-Knox.

- Nicholas Gerten has resumed his position as managing director of the French organization, Compagnie Française Blaw-Knox, a subsidiary of the Blaw-Knox Co., Pittsburgh. During the past four and a half years Mr. Gerten has been assigned to various duties in the domestic activities of the parent company.
- James E. Guillet has been appointed operations manager, Pipe Engineering Co., Stockton, Calif.

- J. L. McCaffrey, formerly second vice-president of International Harvester Co., Chicago, has been elected first vice-president of the firm, succeeding M. F. Holahan, who will remain a member of the board of directors and be available to the management in a consulting capacity. W. E. Worth has been elected second vice-president, succeeding Mr. McCaffrey. Mercer Lee has been elected vice-president in charge of supply and inventory; Peter V. Moulder, R. P. Messenger and Ralph C. Archer have been elected vice-presidents.
- Arthur A. Pieper has been elected financial vice-president of Republic Aviation Corp., Farmingdale, Long Island, N. Y. Mr. Pieper joined the organization a year ago as assistant to the president, in charge of accounting and auditing.
- Lester L. Doughty, industrial specialist for the foundry division of the WPB in Alabama, has resigned to become district sales manager of Reynolds Metals Co., Richmond, with offices in Birmingham.
- Donald B. Hornbeck has been elected president of National Bronze & Aluminum Co., Cleveland.
- E. W. Romig, formerly chief engineer of the Cleveland plant, has been appointed vice-president in charge of the Cleveland district, Claud S. Gordon Co., Chicago. Mr. Romig joined the organization in 1938.

MICHAEL J. DAVANEY, assistant to the manager, Chicago, district operations, and JOHN H. VOHR, assistant general superintendent, South Chicago plant, Carnegie-Illinois Steel Co.



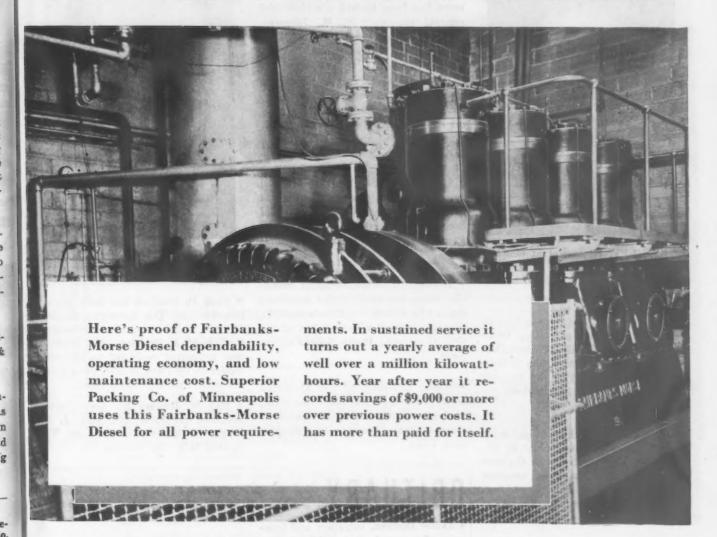


E. W. ROMIG, vice-president, Cleveland district, Claud S. Gordon Co.



A name worth remembering

# FAIRBANKS-MORSE



PRACTICALLY every industrial equipment problem that is submitted to Fairbanks-Morse is similar to problems we have previously solved at some time during our 115 years in business. If you

have a problem, we invite you to draw on our broad, successful experience in applying Diesel engines, generators, motors, pumps, or scales to the needs of industry.



# Diesels

Buy More War Bonds

FAIRBANKS, MORSE & CO., CHICAGO 5, ILLINOIS

Diesel Locomotives • Diesel Engines • Generators • Motors • Pumps • Scales Magnetos • Stokers • Railroad Motor Cars and Standpipes • Farm Equipment



J. J. DUFFY, JR., assistant manager of sales, Pennsylvania Salt Mfg. Co.

- J. J. Duffy, Jr. has been appointed assistant manager of sales, Pennsylvania Salt Mfg. Co., Philadelphia. Mr. Duffy joined the company in 1937, and has since served in the capacity of sales-service and development engineer.
- David A. Nelson, who has been manager of the West Coast plant of Detroit Broach Co., Detroit, for the past year and a half, has now returned to Detroit in the capacity of vice-president and general manager of the company.
- Edson D. Dronberger has been appointed assistant district manager of The American Rolling Mill Co.'s Berkeley, Calif., office; James W. Schofield has been appointed manager of the Kansas City district, replacing Marvin B. Marsh, resigned, and Franklin Wortley has been named manager of the Minneapolis district.
- Dwight P. Robinson, Jr., has been elected a director of the U.S. Smelting, Refining & Mining Co., Boston.
- Harold C. Lenfest has been appointed vice-president in charge of the New York office, Enterprise Engine Co., San Francisco.
- E. Clair Book has been appointed assistant purchasing agent for Lukens Steel Co., Coatesville, Pa., and its divisions, By-Products Steel Corp. and Lukenweld, Inc.

- W. R. Gilmore has been elected chairman of the board of directors, Superior Steel & Malleable Castings Co., Benton Harbor, Mich.; R. L. Gilmore has been elected president and general manager; F. H. Johnston, vice-president and treasurer and Howard Goodman, secretary.
- Ralph S. White, formerly affiliated with the Civil Aeronautics Authority, has been named manager of engineering development, Ranger Aircraft Engines Division, Fairchild Engine & Airplane Corp., Hagerstown, Md.
- Glen W. Shetler has been elected vice-president in charge of sales and promotion of new products, Barium Steel Corp., Canton, Ohio; John P. Fleming has been appointed general manager.
- Bernard S. Meade, formerly executive sales manager of the American Swiss File & Tool Co., Elizabeth, N. J., has been elected vice-president of the firm to succeed Philip Schaeffer, retired.
- Walter E. Moore has been appointed New York district sales manager, American Cable Division, American Chain & Cable Company, Inc., Bridgeport, Conn.



FRED D. DONFORD, treasurer, The American Rolling Mill Co.

- Fred D. Danford has been elected treasurer of The American Rolling Mill Co., Middletown, Ohio, succeeding the late M. A. Brawley. Mr. Danford was appointed assistant to the controller in 1933 and in 1936 was elected assistant treasurer of the firm.
- Ray W. Rowney has been elected assistant treasurer and Mrs. J. H. Flagg, assistant secretary of The Sawhill Mfg. Co., Sharon, Pa.

### OBITUARY...

- James Dickson, secretary and treasurer of Anaconda Copper Mining Co., New York, died March 20 after a brief illness. Mr. Dickson, associated with the company for 32 years, was elected secretary and treasurer in 1940. He was also a director of Andes Copper Mining Co. and Butte Copper & Zinc Co.
- Alexander Turner, 78, vice-president and vice-chairman of the board, National Bearing Metals Corp., St. Louis, died March 20 in Englewood, N. J.
- Leslie M. Hansen, president of the Industrial Silica Corp., Youngstown, Ohio, died recently.
- C. Kier Davis, president of Athey Truss Wheel Co., Chicago, died March 7. Mr. Davis joined the company in 1936 as secretary and treasurer, becoming a director in 1937 and president in 1940.

- Charles F. Cone, vice-president of the George J. Hagan Co., Pittsburgh, died suddenly, March 15.
- Clifford G. Brockman, 56, president and general manager of the Smith & Mills Co., Cincinnati, died recently.
- Lester F. Gilbert, 60, vice-president of the Tube Manifold Corp., Buffalo, N. Y., died March 14.
- Byron H. Newell, assistant manufacturing manager of Buick Motor Division, General Motors Corp., Detroit, died March 12.
- M. A. Brawley, treasurer of The American Rolling Mill Co., Middletown, Ohio, died suddenly March 7. Mr. Brawley had been associated with the Armco organization since 1911. He was made treasurer in 1936.
- William H. Foster, chief engineer and general manager of The E. R. Merrill Spring Co., New York, died recently.



General appearance may not be so radically changed as some suggest but you are going to find many improvements in construction.

To assure greater economy in operation and better performance, you will see more extensive use of aluminum and magnesium alloys.

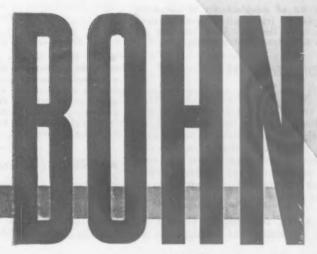
And right here is where the counsel of this organization may be valuable to you. We have a wealth of data covering the use of these light alloys in various applications. Perhaps together we may be able to work out for you a more extensive use of these light alloys than you had thought possible.

### BOHN ALUMINUM AND BRASS CORPORATION

General Offices — Lafayette Building, Detroit 26, Mich.

Designers and Fabricators
Aluminum • Magnesium • Brass • Aircraft-Type Bearings

BUY WAR BONDS



THE IRON AGE, March 29, 1945-81

# Dear Editor:

### **ELECTROLYTIC POLISHING**

We are investigating the possibilities of electrolytic polishing on metallographic specimens. Will you be so kind as to send us a listing of such

R. G. WILLIAMS, Metallurgical Laboratory

Ranger Aircraft Engines, Farmingdale, N. Y.

• We are sending tear sheets of an article from our Jan. 20, 1944, issue, "Electrolytic Polishing of Metallographic Specimens, L. A. Hauser. It contains a bibliography of other articles published on this subject.

### BABBITTING PRACTICE

Please recommend references on techniques used in babbitting bearings, particularly shop practice used for conventional alloys such as 89Sn-8Sb-3Cu and 68Sn-30Zn-11/2Cu.

J. K. MAGOR, Metallurgist

John Inglis Co., Ltd. Toronto, Canada

• Little or no information has been published during recent years in Allied nations pertaining to high-tin babbitt metal. But a good reference is "Bearing Metals and Bearings," by W. M. Corse, published in 1930 by the American Chemical Society as Monograph No. 53. The British "Journal of the Institute of Metals" contains many articles referring to babbitt metals and their application. A list of additional reftheir application. erences to published information on the subject will be mailed, together with tear sheets of "Bonding Low-Tin Bearings to Iron and Steel," from the Nov. 5, 1942, issue, of THE IRON AGE.—Ed.

### RIVETING EQUIPMENT

Sir:

We are thinking of making a new product that will require large quantities of rivets, and a machine will be needed to put them in. We wonder if you could help us find a supplier?

Philadelphia Belting Co., H. PERPALL
Philadelphia 23 A list of manufacturers of automatic machines for inserting and upsetting small rivets is on the way. Some machines are made to perforate automatically.—Ed.

### OXIDIZING FLUXES

In News Front for Nov. 16, 1944, a flux treatment for bronzes developed in this country is claimed to promote greatly increased strength and toughness. It is true that recent papers on this subject read before the Institute of Metals have created interest among nonferrous foundrymen in Great Britain and possibly in America

However, for almost 14 years we have advocated the employment of

oxidizing fluxes for the treatment of bronzes, gunmetals and certain other types of nonferrous alloys. Foseco products of this nature-especially CUPREX-have enjoyed a very wide sale in Great Britain and the Empire, and our associates, Foundry Services, Inc., 280 Madison Ave., New York, 16, has also recommended oxidizing melting to curtail the pick-up of gases from products of combustion.

Manager, Technical Department Foundry Services, Ltd., Birmingham, England

### CUTTING SPEEDS

Do you have any information on speeds and feeds of metals?

C. S. REESE, Purchasing Agent

Hamilton Watch Co.,

 The "American Machinist's Handbook," published by McGraw-Hill Book Co., Inc., and "Machinery's Handbook," published by the Industrial Press, both of New York City, contain speed and feed data. Metal suppliers and cutting tool manufacturers also publish information of this nature with respect to their own products.-Ed.

### MACHINE SHOP DESIGN

We have a request for a suggested machine shop layout for a building 60x150 ft. and would appreciate any suggestions.

GLEN B. JENNINGS,

Cameron & Barkley Co., Tampa 1, Fla.

 The book "Running a Machine Shop," by Colvin & Stanley, published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York (\$3.50), has a chapter on planning a shop which includes a number of typical floor plan layouts.—Ed.

### COLD TREATMENT

We should like to obtain information on low temperature freezing for tools, gages, etc.

MONROE SELIGMAN

Tenney Engineering, Inc., 8 Elm St., Montclair, N. J.

• The March 15 issue contains an article on "Cold Treatment in Gage Stabilization," a protection against growth due to aging. Another article on cold treatment of metals appeared on Feb. 25, 1943, in which some data are presented on the seasoning cycle. Sorry, but we do not have tear sheets of the latter to send.—Ed.

### AGGREGATE FROM SLAG

A small concern in the Denver area has made the following inquiry: "We would like to have information regarding the use of blast furnace slag

for lightweight aggregate to be used in the manufacture of building blocks."

LESLIE L. WAYMIRE, Consultant, Technical Advisory Service

Smaller War Plants Corp., Denver 2, Colo.

 Blast furnace slag has been used as concrete aggregate for many years. For this purpose the slag is usually crushed to sizes ranging from 1/4 to 21/4 in. A lightweight aggregate suitable for use in building blocks is made by the Thomas Works of Republic Steel Corp., Birmingham, Ala. They treat dry granulated slag in such a way as to produce tiny air cells that bring the weight down to between 32 and 46 lb. per cu. ft. Considerable work in the use of slag for ready mixed concrete has also been done by the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.-Ed.

### ISOTHERMAL TREATMENT

There is a short discussion in the Feb. 15 News Front of isothermal treatment in liquid baths for Army Ordnance pistol parts. Can you advise where we might obtain additional information on this subject?

C. ADRIAN GABIG, Purchasing Agent

Brainard Steel Corp., Warren, Ohio

• There was an article on this subject in the Feb. 8 issue of The Iron Age, page 42.

### TOOL STEELS

Sir:

We are interested in the series of charts comparing different tool steels. Please send us a copy.

GEORGE B. BARRON, Chief Engineer

The Maryland Drydock Co., Baltimore, Md.

Will you please send me one copy of the Directory of Tool, Metal Cutting and Die Steel and Sintered Carbide, for which I enclose a dollar.

ROLLEY HOWELL,
Superintendent, Axle Division
Cleveland

Please send me the Directory of Tool Steels and Other Metal Cutting Materials, by T. W. Lippert.

Equipment Development & Engineering Section Lancaster, Pa.

 Single copies sell for \$1; 5 or more cost 50c each.—Ed.

### TIPPED TOOL STEELS

The article "Tipped High Speed Steel Widely Used, Survey Shows," by Frank J. Oliver, in the Jan. 8 issue, is interesting, even though somewhat confusing. However, it gives much food for thought in many ways. If available, we could use three reprints of this article.

W. H. WHITE, Director of Sales

Atlas Steels Limited, Welland, Canada

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Muehlhausen's ability to produce forged flat springs in large quantities, and to any special design, has given product engineers greater latitude in developing improved war matériel-

and provided greater speed in producing it.

This is the result of Muehlhausen's complete hot forming facilities - huge presses, controlled-atmosphere furnaces, quenching tanks as big as swimming pools, a control laboratory for testing and checking-all housed in a separate, complete plant, specially designed for volume production of heavy springs.

Don't let the improvement of your product be hampered by spring problems. Consult Muehlhausen engineers and get the benefit of their experience. Muehlhausen's ability to produce unusual springs may help you do things never before thought possible. Send for Free Die Spring Bulletin.

MUEHLHAUSEN SPRING CORPORATION

Division of Standard Steel Spring Company

817 Michigan Avenue, Logansport, Indiana



# This Industrial Week . .

- Order Volume Passes Secondary War Peak
- March to Be Highest Recent Production Period
- Cancellations Due to CMP Allotment Cuts Are Heavy

THE secondary steel order peak of the war appears to have passed this week, as for the first time this year some mills reported reductions of backlogs. An overall improvement in the steel production picture is contributing, with some cancellations, to this backlog reduction. Improvement in the railroad car situation, the end of cold weather, and in some cases better local operating conditions have combined to put both ingot and finished steel production on a higher plane.

Preliminary production reports for March indicate that, although few wartime records will be set, output will be the highest for several months. Chicago's operating rate this week, 103 per cent, is the highest in 11 months, and operations in Pittsburgh have assumed a more "normal" character for the first time in nearly two and a half months.

Cancellations, which are having an important effect on backlogs this week, are largely from customers who have had their second quarter CMP allotments cut, rather than from schedule changes or curtailments. One company reported that cancellations totaled approximately 25 per cent of new bookings. There, is still a marked reluctance on the part of many civilian manufacturers to remove from mill books tonnage for which second quarter authorization has been revoked, and the mills take the attitude that it is not their responsibility to police the validity of authorizations which have been handed them.

Some eastern mills last week were reported to be seeking plate business for May delivery. Although no announcement has been made, it is conjectured that cutbacks in the tanker construction program may have created spot openings. This reported cutback may be offset somewhat by renewal of contracts held by Midwestern landing craft builders. Overall Maritime Commission plate requirements appear to be making their oft-rumored slide, and by July seem destined to be less than 40 per cent of the July, 1944, level.

Some plate mills are actively hunting business for the third quarter. As one producer stated this week, his salesmen are soliciting orders for plates for any month after August. Certain producers feel that Maritime reservations of plates will be completely abandoned shortly thereafter. A general decline in plate demand may conceivably hasten decisions to be made by government and industry with regard to Western steel plants and their plate capacities. established primarily to serve the Pacific Coast shipbuilding industry.

Warehouse stocks have expanded somewhat as a direct result of the improved situation at the mills, which have been able to catch up on deliveries because of higher production and additional available freight cars. Finished materials that have been stacked around the mills since the period of inclement weather and freight embargoes is at last getting underway.

Order volume is being dictated closely by available stocks, and March orders will be higher. Delay in shipment of CMP orders by mills continues to throw a larger than usual proportion of production business to the warehouses. Threatened cuts by the WPB, now in the discussion stage, in steel allotted to warehouses for the third quarter are considered by some as too remote to cause immediate worry. Some sources indicate that warehouses will get additional galvanized sheets in the future.

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ALVANIZED and cold-rolled sheet production continues below its peak, because of manpower shortages, while new business in these lines continues to be heavy. Deliveries in 1946 quoted on galvanized sheets are now being approached by fourth quarter quotations on cold-rolled sheets. The most recent development has been the attempt to place a substantial tonnage of galvanized sheets with producers for delivery to France.

New orders to fill holes made by cancellations are principally for shell and powder containers with one mill reporting a 4000-ton sheet order on a directive for powder containers, while another customer has been assured of a directive guaranteeing shipments of 700 tons a month for shell containers beginning in May for a total of 3000 tons. Delayed deliveries are not as yet bringing serious complaints from customers. A lack of labor to fabricate more steel than is being received, plus a reliance on inventories appears to be responsible.

Despite the receding order volume, it is apparent that war business will hold up strongly past the close of the European phase of the war in line with the Army's anxiety not to repeat 1944's mistake of overconfidence. Extreme pressure has already been applied to steel orders to build up supplies for the Pacific War as early as possible, and this pressure is likely to continue as long as it is thought practicable. One unfortunate result, apparently now unavoidable, is that when the war does end American industry will be heavily occupied in war business.

Railroad car inquiries include 250 50-ton box cars for the Consolidated Railroad of Cuba. American Car & Foundry holds an order, not yet authorized, for 1500 40-ton box cars for Mexico. The Canadian National Railway has placed an order with Eastern Car Co., Ltd., Trenton, N. S., for 500 50-ton box cars; Seaboard Railway has rejected all bids on 48 passenger cars and is calling for new bids.

THERE are some indications that mills are watching the war trends carefully in placing orders for iron and steel scrap. No longer are orders placed in a high, wide, and handsome manner in order to encourage shipments. Moreover, mills are carefully scrutinizing incoming shipments, particularly turnings, and faint grumblings about rejections are being heard.

84-THE IRON AGE, March 29, 1945

• STRUCTURAL BOOKINGS—February bookings of fabricated structural steel for bridge and building construction, reported to the American Institute of Steel Construction by companies representing 75.3 per cent of the total average bookings of the industry during the years 1923-1925, totaled 57,333 tons, as compared with 39,953 tons reported for the preceding month, and 37,477 tons reported for the corresponding month of last year. The reported shipments for bridge and building construction totaled 36,283 tons compared with 42,938 tons reported for the same month last year. The reported tonnage available for future fabrication at Feb. 28 was 151,605 tons.

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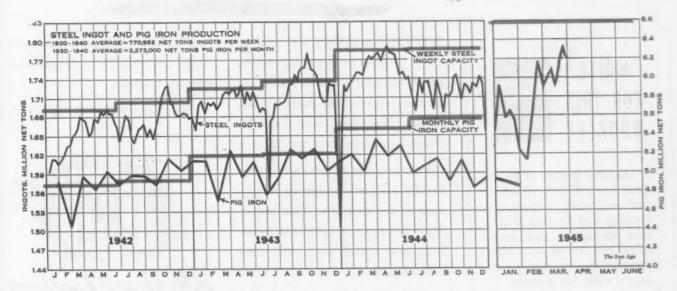
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- SLEEPING CAR POLL—Results of a poll taken among sleeping car passengers on the New York Central System indicate that air-conditioning and the comfort of private room accommodations are their chief desires in postwar travel. An outside research group queried thousands of New York Central passengers and it is reported that 90 per cent of the questionnaires were returned completed. A total of 160,000 answers were made to individual questions. The survey revealed that among all types of present and proposed overnight accommodations, the new roomette and bedroom and the proposed duplex roomette and duplex bedroom were the leading favorites. It is expected that these modern features in passenger train service will require substantial amounts of that type of equipment and products which have come to the forefront as a result of wartime research.
- STEEL PRICES—The relief for steel prices asked by the steel industries, in addition to the interim increase granted for five items on Jan. 11 of this year, seems to be justified, according to steel sources. The present price tables, with the exception of those products which have been advanced, dates back to 1939. At that time the steel price level was "realistic." Only a year before, major steel companies gave up the ghost of "published" prices and reduced the going price to that which had been generally quoted to customers who had the cash and the tonnage orders. Since that time, wage costs have really skyrocketed and material costs are higher. The industry has been able for the past few years to weather the storm, only because most steel companies have had government contracts for shells, ships, and other war materials which carried the

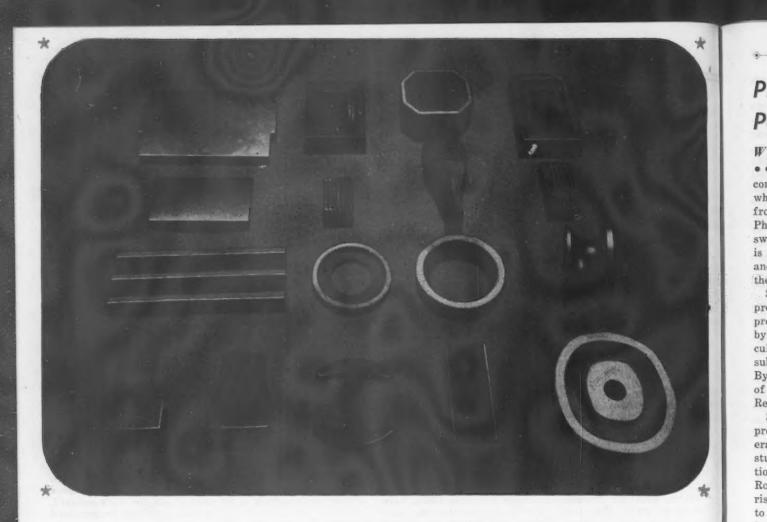
- load for "loss leaders" such as plates, structural steels, and a few other items. The picture is now changing and the industry is or will soon enter a distribution pattern of sales, which goes back to "normal."
- REPUBLIC ORE CONTRACT—Republic Steel Corp. has signed a contract with the Lone Star Steel Co., Daingerfield, Tex., which calls for 100,000 tons of concentrated east Texas iron ore. Shipments, which will be by rail, approximating 25,000 tons of beneficiated ore monthly, will be made from Lone Stars' Daingerfield plant to Republic's plants in Birmingham and Gadsden, Ala. Tests of the east Texas ore show that the beneficiated product contains well over 60 per cent of iron units.
- FARM IMPLEMENT PLANTS RECONVERTED—Between 80 and 90 per cent of the output of farm implement plants in the Quad Cities—Davenport, Iowa; Moline, East Moline, and Rock Island, Ill.—has been reconverted to implement production, according to Herbert P. Wilson, spokesman for chambers of commerce in those cities. The ratio of implement production to war production almost exactly reverses that existing two years ago, Mr. Wilson said.
- MORE STEEL OVERTIME—Declaring that they have the backing of both labor and management, WPB officials on March 26 announced that plans were agreed upon by the Iron and Steel Industry Advisory Committee at its meeting on March 22 to make available additional overtime work in steel mills for all qualified employes who are willing to accept such work. To date it was said, companies representing 72.2 per cent of the combined total employment the industry, as well as steel union leaders, have approved an overtime program at the rates of pay for work involved, wherever the additional work can contribute to increased production of essential items.
- BUFFALO EARNINGS—Average weekly earnings of Buffalo factory workers in a representative group of plants dropped from a record high of \$56.50 in January to \$54.87 in February, the Statistical and Research Department of the Buffalo Chamber of Commerce reports. Employment in the plants showed a decline of 891 to 112,427 while average weekly payrolls were down \$233,644 to \$6,169,225.



### Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
March 20	92.5	102.5	92.0	97.0	97.0	106.5°	90.0	99.0	100.0	86.5	91.5	94.5	99.0	96.5
March 27	93.0	103.0	92.0	97.0	94.0	106.5	92.0	99.0	101.0	91.5	90.0	94.5	94.0	96.5

<sup>\*</sup> Revised



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# Philip Murray Discloses USWA Postwar Plans in Special Proposals

Washington

• • • Broadening and working into a comprehensive pattern proposals which he has heretofore suggested from time to time, CIO President Philip Murray has come out with a sweeping program which he declared is necessary to assure full production and full employment during and after the war.

Sent to all CIO international union presidents, Mr. Murray said that the proposals, calling for "great ingenuity by the leaders of industry, labor, agriculture and Government" will also be submitted to War Mobilizer James F. Byrnes through the Advisory Board of the Office of War Mobilization and Reconversion.

Standing out prominently in the proposals are: A demand for a general wage increase before VE-Day; a study of the annual wage, a suggestion also made recently by President Roosevelt, and keeping prices from rising. Mr. Murray specifically pointed to the application of the annual wage in the steel industry. The USWA demand for a guaranteed annual wage was recently denied by WLB but it suggested that the subject be given further study.

Taking the cue, Mr. Murray said that the annual wage for the steel industry requires that labor and management in that industry study the uses of their product and discuss with the industrial consumers of iron and steel ways and means for stabilizing their demands. Once that inquiry is undertaken, Mr. Murray said, it opens up many new vistas, and "we begin to see the markets for our goods and services in terms of human needs and wants and in terms of full use of our capacity to produce."

Pointing to the needs for 50 per cent more peacetime production than ever before, he stated that this means an enormous increase in the quantities of goods and services going to every individual American family. Giving support to the report that USWA is making an effort to have OPA deny further steel price increases with the apparent thought that such action would improve the chance of getting at least a part of the 17c. an hr. wage increase so far denied by WLB, Mr. Murray proposes that prices be kept down. He declared that the abundance of goods and services arising from greater peacetime production

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can be distributed only by raising money incomes and keeping prices from rising "or by lowering prices as productivity increases."

Mr. Murray's plan calls for immediate action by management, labor, agriculture, and government on the following: To learn what is needed for "Jobs for All" in war and peace; to bring together the necessary information on which to base a program; an orderly reconversion plan to go into effect on VE-Day; a general wage increase before VE-Day and agreement on a reconversion price policy after VE-Day.

Developing his suggestion for an annual wage in the steel industry, Mr. Murray said that the war has so expanded the productive capacity of the United States heavy industries that it will be necessary to sustain a greatly increased use of iron and other heavy goods here and abroad if the heavy industries are to operate at capacity.

"An inquiry into the physical needs at home and abroad, for redevelopment of America's communities, rebuilding of our transportation network (by road, rail and water), power expansion, and the reconstruction of nations abroad, will show a sufficient backlog to keep these industries going at capacity for years ahead," Mr. Murray said. "To use this capacity we shall need first to make up our minds to use it, and then to reach a joint agreement on this part of the production program. Once we have worked out ways and means for keeping our heavy industries operating at capacity, the rest of the job becomes much more manageable. Heavy industry is today the backbone of the United States economy."

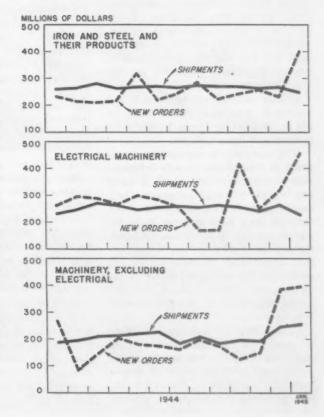
Mr. Murray further proposed a nation-wide series of "Community-wide Committees Representing a cross section of the community, including the surrounding rural areas to ask these three basic questions:

- 1. What goods and services do we need?
  - 2. What do we want?
- 3. What local capacities do we have for supplying our own needs and wants and what capacities do we have for exchanging goods and services with others at home and abroad?

"By making such a physical inventory of our public and private resources for supplying our needs and wants," Mr. Murray said, "we shall have gone a long way toward an

ORDERS SHIPMENTS: This chart prepared by the Bureau of Foreign and Domestic Commerce shows the value of new orders and shipments from the beginning of 1944 through January, through 1945, for three of the most important durable war industries - iron and steel, electrical machinery, and machinery. Although data refer only to the specified firms in each industry which regularly re-port both shipments and new orders, the general trends shown may be taken as indicative of the situation in the entire industry.

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economy of full production and full employment.

"In addition to the work of these community committees on a local, state and regional basis, much of the job of preparing inventories and programs, industry by industry, should be carried out by a Bureau of Programs, to centralize the information from cities, states and regions, from various industries, and from national organizations, private and governmental, on which to base the transition

program. This Bureau was provided for in the Murray-Kilgore bill and should be enacted by Congress at an early date. Use should be made of joint industry committees of labor and management, advisory to the various government agencies. The national job requires that the Advisory Committee to the Director of War Mobilization and Reconversion be strengthened by statutory or executive authority so that it may take the lead in developing a national program."

and will not have to start from scratch, he said.

DPC views temporary leases with favor as a means of bridging uncertainties of the immediate postwar period in the marketing, employment, and financial fields. About a dozen leasing negotiations have been closed or are about to be closed, he revealed. Although most DPC leases limit the plant to war work during the war period, arrangements can be made, by paying a higher rental, to employ facilities for civilian production when not needed for war work.

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In disposal of DPC plants, negotiations are predicated on the basis of today's replacement cost, using present material and labor costs under normal construction methods. Deductions are made for depreciation and, where necessary, the cost of alterations necessary to make the plant suitable for peace-time operation. This policy serves to put prospective purchasers of DPC owned facilities on an even basis with operators of other plants holding RFC loans, who have enjoyed amortization privileges through certificates of war necessity.

### RFC Making Survey On Postwar Markets For Geneva and Fontana

Chicago

• • • Reconstruction Finance Corp. is making surveys of potential postwar markets of both the Geneva, Utah and Fontana, Calif. (Kaiser) steel plants, Hans A. Klagsbrunn, deputy director of surplus war property, RFC, and executive vice-president, DPC, told the war problems school of the Chicago Association of Commerce here recently.

DPC owns the Geneva plant, and Kaiser holds an RFC loan on the Fontana plant. Klagsbrunn pointed out that although the Fontana plant was not government property, the government wished insofar as possible to avoid postwar overlapping of the two plants, thus providing maximum opportunity for both. A definitive answer as to exact markets is not expected to result from the surveys, he said, but the material is expected to provide a valuable basis for putting the plants to work.

Similar surveys will be made in the aluminum and magnesium fields to aid in formulating disposal policies on government owned plants.

DPC currently is engaged in a program to disseminate broadly information concerning plants which it owns and to enter into negotiations for their sale or lease as soon as possible, even through they have not yet been declared surplus, Klagsbrunn declared. He expressed the hope that consideration of postwar problems concurrent with war responsibilities would shorten the period of reconversion, and dissipate anxiety as to the future, thus raising morale.

Engineering surveys are complete on plants constructed before or during 1944 and reports are available at regional DPC offices or at Washington. Individual brochures are being prepared covering 650 general purpose plants and other plants which are considered marketable. About 250 or 300 are ready for distribution, but extensive publicity on them is being withheld in deference to the armed services and possible detrimental effect on war production.

Although only 18 or 20 facilities have been declared surplus, over 200 negotiations for sale or lease of plants are underway, some of them well along, Klagsbrunn declared. It is the aim of DPC to preserve continuity of operation so that the buyer will have the benefits of an intact labor force

# Hot Topping Capacity Again Seen Less Than Monthly Requirements

Washington

• • • With present quality steel requirements for all products estimated at about 2,480,000 tons monthly as compared with a capacity of 2,200,000 tons, WPB officials told members of the Metallurgical and Operations Industry Advisory Committee at a recent meeting that failure to obtain sufficient tonnages of "hot topped" steel for shell forging may endanger fulfillment of the Army's ammunition program.

New equipment, they said, such as cranes, loading platforms and other expediting items are expected to add 150,000 tons monthly to output in the next few months, reducing the deficit in requirements to about 130,000 tons monthly, but making further increases in hot topping facilities "absolutely essential."

Steel Division officials disclosed that some success has been achieved in using heavy discards as a substitute for hot topped steel. It was stated that about one-third of all carbon steel and practically all alloy steel ingots are now being poured into hot topped molds.

The committee also considered methods of increasing production of alloy steels and super alloys for the jet propulsion plane program.

Agreement was made between the committee and WPB on the establishment of a new reporting system on open capacity. The committee recommended that each mill notify the WPB Steel Division when open capacity is available in each unit of the steel industry.

### J&L Head Says Higher Steel Prices Needed

Pittsburgh

• • Classifying the price adjustments made by the OPA effective Jan. 11 as "small," H. E. Lewis, board chairman, Jones & Laughlin Steel Corp., said, "These price increases are totally inadequate and it is urgently necessary that the steel industry be granted further price increases to compensate it for the substantial increases in its operating costs."

In the company's annual report, Mr. Lewis pointed out that sales and earnings for the company in 1944 amounted to \$290,087,880, compared with \$280,676,172 in 1943. Net income after taxes, etc., in 1944 was \$7,519,668, compared with \$9,512,228 in 1943.

### Some Canadian Plants Start To Get Ready for Peacetime Production

Toronto

• • Despite the fact that Canada's war production program is absorbing approximately 80 per cent of all domestic steel production, and will continue to do so as long as the war in Europe continues, some thought again is being given to peacetime manufacturing activities. Although there has been no direct action in this respect, it is reported that a number of plants that have abandoned war work, largely through contract cancellations, are now engaged in putting plants in shape for a start on peacetime production as soon as raw materials and labor are available.

Earlier in the year it was announced in government circles that with the fall of Germany, there would be a cutback in Canadian war operations of at least 35 per cent, but more recent estimates point to a cutback as soon as Germany is defeated of about 20 per cent and this will be steadily increased to 40 per cent, placing Canadian industry on a 60 per cent war production footing for the defeat of Japan.

Recent reports from the Western battlefronts appear to indicate an early end to European hostilities, but despite these reports there is no intention of again slackening production of war materials until the fighting has actually come to an end. Last year with over-optimistic reports from Europe, Canadian war production was allowed to fall into a slump. Many plants, especially those working on guns, shells, and ammunition were closed down or production schedules sharply reduced, with the result that when the call came for greater supplies of war materials, plants again had to be put into shape for operation and new workers employed at considerable expense and difficulty.

Since the turn of the year, Canadian industry has obtained big contracts for shells and munitions from the United States, which added to the big commitments previously held from Great Britain and from the Canadian Government, resulted in war production again stepping up to an all-time record peak.

In the past few weeks there has been heavy outpouring of orders for ships and other war supplies to be used against Japan, and it might now appear that a large part of Canadian production eventually will find its way to the Pacific battlefronts. In aircraft production there has been sharp curtailment, and thousands of workers have been laid off from these plants.

Against this curtailment there has been a sharp step-up in operations of shell plants and producers of various other types of munitions. Shipbuilding contracts totaling approximately \$25,000,000 have been placed with Canadian builders in the past month or six weeks, and practically all yards across Canada now are assured of operation for the remainder of this year.

This new war business has been reflected in a sharp jump in demand for iron and steel materials, with the result that Canadian steel mills now are solidly booked on the greater part of their production to the first of July, and on such materials as bars and sheets, backlogs extend well into third quarter. This gain in war demand for steel has closed the doors of supply to non-war industry, and many companies that had hopes of resuming their normal activities early this year, now are as much in the dark as to when civilian production may be started on a large scale, as they were two years ago.

For the more essential non-war production such as builders of railroad rolling stock and farm implements, the cut in steel supply has not been as drastic as in the less essential industries. Practically all business now going on the books of Canadian steel producers is on an if, as, and when delivery basis, while prices all are set as at time of shipment.



BERLIN EXPRESS: Now severed by advancing Yanks, this double lane highway is part of the network of military roads built by Hitler to defeat the Allied nations.



PROSPECTIVE AIRSTRIP: Ploughing through the mud like an amphibian, this scraper is helping to turn a former Philippine swamp into a landing strip. Navy Seabees used swamp water to clean from their trucks the mud which had to be moved. Pits dug to reach top-grade coral were filled with trees rooted out of the swamp.

# Surplus Disposal Complexity Scored in Mead Committee's Report

### Washington

• • • "To date no administrative explanation of policies or of their application to specific cases has been made by the Surplus Property Board. This is undoubtedly due to the complete lack of satisfactory organization among the surplus disposal agencies to date. There is no integration. There is no set of guiding criteria. There is no single place to which a prospective purchaser can go for information."

Thus, the Mead (Senate) Investigating Committee summed up its criticism of the government surplus property (other than industrial plants) disposal efforts in a sharply worded report on March 22.

Committeeman Homer Ferguson, Republican of Michigan, told THE IRON AGE that unless this confusion is soon ironed out, the chaotic administration that characterized government surplus sales after World War I would be repeated after this war.

In describing what it thinks is wrong with surplus property disposal, the committee emphasized the following:

1. Surplus property declaration has been sluggish with resultant constant threat to existing markets.

2. Consumer goods should be sold by one agency to avoid confusion and inefficiency and prevent duplication of

3. The disposal organization should be as simple as possible with the minimum number of agencies operating under the Surplus Property Board. (The effect of having a multiplicity of agencies is to make it easier for "insiders" to operate.)

4. SPB should set-up uniform rules and regulations and a single information center, so that persons seeking to learn about surpluses will be able to get all the information in one place.

5. To prevent frauds and to instill public confidence, SPB should have and widely publicize an investigative department, responsible directly to the board and empowered to investigate all disposal agencies and all complaints dealing with surplus property.

6. Immediate and wide publicity should be given to all actions, including offers for sale, sales bids, and all other activities. Even when goods are offered to only a limited group, wide and unrestricted publicity should be given to the facts.

7. Personnel should be chosen with extreme care. The report said that the opportunities for giving available information to favored persons will prove a constant source of temptation to all persons engaged in surplus disposal.

8. All sales should be open to all bidders, but the committee thought that exceptions should be made to veterans, governmental agencies, or to other groups specifically designated in the Act.

9. Small business should be encouraged to buy surpluses by offering small lots when feasible.

10. The Army and Navy and other agencies should immediately determine disposal procedures for foreign surpluses to prevent a period of confusion after the end of the European War.

11. Termination inventories should be brought under the control of SPB.

12. Spoilage should be prevented by more careful storage methods.

13. Goods and industrial equipment have been sold as surplus when these same items were still being procured by the government and better clearing house procedures should be instituted to prevent the recurrence of this waste.

14. Every effort should be made to minimize marketing costs.

15. Congress should make an early decision about the scrapping of 60 to 65 per cent of all surpluses estimated to be military and consequently of no commercial use. The report adds that perhaps usable surpluses might have to be scrapped to prevent impairment of the economy.

### COMING EVENTS

April 4-6—SAE National Aeronautic Meeting, New York. April 12-14—Electrochemical Society, Inc.,

April 12-14—Electrochemical Society, Inc., Philadelphia—Atlantic City Congress, Atlantic City, N. J.

### CANCELLED

April—American Zinc Institute, St. Louis.
April 26-27—Annual Conference, OpenHearth Steel Committee and Blast Furnace and Raw Materials Committee, Iron
and Steel Division, AIME, Chicago.

April 30—May 4—American Foundrymen's Association, Detroit.

May 21-22—American Steel Warehouse Association, 1945 Convention, New York. May—American Gear Manufacturers Association, general meeting.

ciation, general meeting.

May—General Meeting, American Iron &
Steel Institute, New York.

The report said that in determining price policies special consideration should be given to articles which are in great demand. After being used to fill priority needs of governmental agencies, local government and some types of institutions, articles in great demand should be sold to the public at a reasonable price comparable to retail prices for similar articles. If the government's supplies are of a higher quality than the usual retail article, then the public should be made to pay the higher price, the committee said.

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Like the Baruch recommendations the committee's report warns against the sale at very low prices of articles of which the supply is not particularly short, which will permit wholesalers to resell at large profits.

# Establishes Machine Tool Trading Pit For Releasing Idle Tools

### Washington

• • • A machine tool trading pit devised as a means of promptly redistributing idle production equipment for use in accelerating the manufacture of munitions in thousands of American plants was established in January by the military services and the production agencies, RFC announced recently.

Through March 8, a total of 4463 items had been authorized to be sold, transferred, or leased, but applications on 255 items were turned down because war need had not been sufficiently demonstrated.

Composed of less than 20 officers and civilians, representing the Army, Navy, RFC, WPB, and the Maritime Commission, the pit operates five days a week at the RFC in Washington. Sales are made, however, not on a basis of price, but on the basis of the urgency of the need for the tools in war production.

Prior to the establishment of the pit, RFC in December issued instructions to field engineers to inspect all DPC projects and to report machine tools and production equipment of a critically needed nature that could be made available for other war production. The Army and Navy have also called for listings for machine tools in the possession of their lessees which are not currently needed on war contracts.

The trading pit deals in both used and new tools and wherever applications are received by WPB for new tools from war contractors needing equipment, costing more than \$3000, used tools that are available are recommended wherever suitable.

Prior to the establishment of the pit, RFC in December issued instructions to field engineers to inspect all DPC projects and to report machine tools and production equipment of a critically needed nature that could be made available for other war production.

Representatives of the services possess full authority to (1) release tools under their control for service elsewhere and (2) to accept tools in behalf of the production requirements for their services.

The trading pit is used to expedite the settlement of conflicting claims among the agencies so that ultimately tools may be channeled to non-military production.

The Review Committee, whose chairman is Roger A. Wilson, DPC Machine Tool Section chief, settles controversies which may arise by several services or their branches wanting the same tools.

Walter Joyce, DPC vice-president, is chairman of an Executive Committee which supervises the entire operation and solves problems referred to it by the Review Committee. The committee is composed of representatives from the Army, the Army Air Forces, Navy Bureau of Aeronautics, Navy Office of Procurement and Material, WPB, and DPC.

# Provisions Made for Informal Consideration of Disputed Claims

Washington

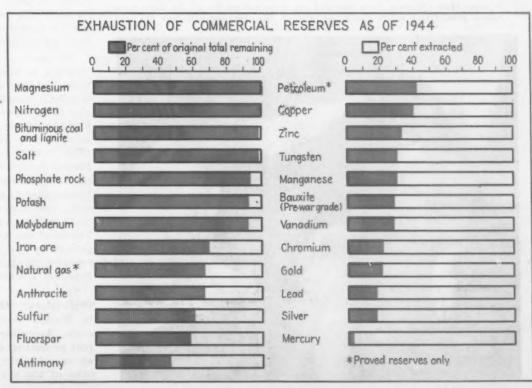
• • • Drafted with a view to providing speedy and equitable decisions, the Office of Contract Settlement has issued Regulation No. 15 establishing a procedure for informal consideration of disputed claims filed by war contractors with the OCS Appeal Board. Under the new regulation, a war contractor is not required by the director of contract settlement to protest or appeal within the contracting agency before appealing to the board. At his option, he may either appeal directly to the board, or, before taking such an appeal, he may protest or appeal within the contracting agency, if the agency has established protest or appeal procedure.

Robert H. Hinckley, director of contract settlement, pointed out that a war contractor may appear on his own behalf in any proceeding before the board, and may also be represented by any qualified attorney-at-law or certified public accountant. The hearings of the board will be held at places to meet the convenience of the appellant, in so far as possible, Mr. Hinckley said, and will be public unless otherwise ordered by the board. An appeal may be initiated by filing an informal notice of appeal that sets

forth, among other matters, a brief summary of the issues. In addition the appellant is required to submit affidavits and other pertinent documentary evidence in support of the appeal. Copies of these papers will be forwarded to the contracting agency by the board. Within 20 days after forwarding, the contracting agency is required to file an informal response that briefly summarizes the disagreement between the appellant and the agency and states the agency's position. The agency is required to file with the response affidavits and other pertinent documentary evidence in support of its findings or failure to make findings. Either party may file written argument at the time of filing supporting documents.

The Appeal Board at the present time consists of two full-time members and will be augmented from time to time as the situation requires by the addition of further full-time members and part-time panels, Director Hinckley said. Robert S. Stevens, dean of the law school of Cornell University, on leave, is chairman of the board. George O. May, New York, former senior partner of the accounting firm, Price, Waterhouse & Co., is the other member.

**EXHAUSTION OF MIN-**ERALS: Future additions to the national reserve depend on utilizing known low-grade deposits, and the discovery and development of deep-seated or concealed deposits, according to Elmer W. Pehrson, chief, Reonomics and Statistics Branch, U. S. Bureau of Mines. Note the favorable position of coal and the fertilizer materials and the relatively depleted state of our metallic reserves. The abundance of brines and ocean water-raw material for magnesium, and airraw material for nitrogen, there has been no exhaustion of these resources. Estimates of national reserves from a study jointly by the U. S. Geological Survev and the Bureau of Mines.



### January Earnings For Manufacturing Workers Reach All-Time Peaks

New York

• • Average hourly and weekly earnings of wage earners in the 25 manufacturing industries surveyed each month by the National Industrial Conference Board were at all-time peaks in January of \$1.099 and \$50.80, respectively, while "real" weekly earnings exceeded the former high of June 1944.

These figures include overtime and other monetary compensation.

The changes in payroll statistics from December to January as shown by survey are summarized as follows:

Hourly earnings rose 1.2 per cent to \$1.099. They were 5.1 per cent higher than in January 1944, and 44.8 per cent above the level of January 1941, base date of the little steel formula.

Weekly earnings at \$50.80 were 1.8 per cent higher than in December, 6.8 per cent above those of January 1944, and 66.0 per cent above January 1941.

Real weekly earnings, or dollar weekly earnings adjusted for changes in living costs, rose 1.7 per cent in January. They were 5.0 per cent greater than in January 1944, and 35.1 per cent above January, 1941.

Hours worked per week averaged

46.1, or 0.7 per cent more than in December. The average was 0.9 hr., or 2.0 per cent above January 1944, and 5.9 hr., or 14.7 per cent above January 1941.

Employment in the 25 industries declined 0.4 per cent in January. It was 9.8 per cent below January 1944, but 22.8 per cent above January 1941.

Man hours worked in the 25 industries rose 0.2 per cent but were 8.1 per cent below January 1944. They were however, 40.8 per cent above January 1941.

Payrolls increased 1.4 per cent in January, but were 3.7 per cent below those of January 1944. They were 103.8 per cent higher than in January 1941.

### Pittsburgh Coke Sales Off

Pittsburgh

• • • Pittsburgh Coke & Chemical Co. has reported gross sales of \$19,097,-911 for 1944, which because of a discontinuance of a DPC facility were smaller than the all-time high of 1943. Net profit for 1944 was \$282,000.

Previously the company owned a 50 per cent interest in Chemical Sales Corp., and in 1944 purchased the balance of the stock in this company. This selling organization deals in coal tar chemicals and sells other kinds of industrial chemicals used in the Pittsburgh district.

EYE TESTING: Kropp Forge Co., Chicago, in order to protect its employees and increase their efficiency, have provided eye examinations for all. In those cases where prescription safety glasses are needed, the company will bear the cost.



### Kennecott Copper Co. Seeks Expanded Field

New York

• • • The Kennecott Copper Corp. is apparently planning to extend its interests beyond those permitted by its present certificate of incorporation. In a statement on the proxy recently mailed to stockholders, the directors signify a desire to amend that paper to permit the purchase or other acquirement, lease, development, prospecting, exploration, discovery, location, sale and dealing in lands, quarries, mines, mineral locations, including those containing or believed to contain oil or gas, water and water rights, of all kinds, and any interests in any or all of the foregoing. It also provides for the erection or purchase of various types of plants for treatment and refining.

If successful this action will permit the company to acquire and develop resources of every kind in the air, earth or water, including but not limited to, copper, gold, silver, lead, zinc, molybdenum, oil, gas, coal, coke, charcoal and other fuels.

American Smelting Net Down
New York

• • Net income for the American Smelting & Refining Co. and subsidiaries in 1944 amounted \$8,627,072 or \$2.34 a common share, compared with \$11,749,978 or \$3.76 a share in 1943. A loss on investments in and loans to some of the company's subsidiaries after deducting estimated tax savings for 1944 amounted to \$3,386,613.

The company charged off its nickel property in Brazil about which great hopes had been entertained. Although a difficult metallurgical problem was said to have been solved, it was later found by the company that the process as applied to actual Brazilian conditions would not permit a profit. Pioneer conditions due to geographical remoteness of the mine and other factors such as scarcity of labor were such, the company said, that they could not be successfully overcome. The result was an abandonment of the project by the company which surrendered its shares for the benefit of Brazilian stockholders.

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The company also closed down a silver mine of the Kildun Mining Corp. in Mexico, due to high operating costs. According to the company's report production costs were about 49c. an oz. of silver, compared with the price of 45c. per oz.

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# American Locomotive Unfilled Order Volume Totals \$260 Million

New York

• • • As of a recent date unfilled orders of the American Locomotive Co. totaled \$260,000,000, including \$117,000,000 for war products and \$118,000,000 for steam and diesel locomotives, according to W. C. Dickerman, chairman. A strong foreign demand for locomotives is predicted in the company's report and "the company is prepared to compete aggressively for post war business."

The company's shipments in 1944 amounted to \$312,722,300, of which 44 per cent was specialized war output and 56 per cent regular products. Of the latter, the total of which was \$174,691,000, a little more than half was regular product war orders and the balance regular commercial orders. Commercial shipments in 1944 were 27 per cent of total shipments. Total shipments in 1943 were \$428,905,600, of which 69 per cent was specialized war products and the balance regular products.

Net profit for the company in 1944 amounted to \$8,664,668, equal, after preferred dividends, to \$4.58 a share on common. Sinking fund requirements reduced the earnings per common share to \$3.86.

In 1944 American Locomotive sold its entire holdings in The Superheater Co. and approximately 29 per cent of its investment in the common stock of General Steel Castings Corp.

In the five years ended December, 1944, production of important war materiel included the delivery of 11,-490 combat vehicles, 2,100,000 shells, and 3463 steam and diesel locomotives.

# GE Orders Increased 18 Per Cent in 1944

Schenectady, N. Y.

• • • Orders received by General Electric Co. in 1944, the majority of which were for war products, amounted to \$1,609,600,000 which was 18 per cent greater than in 1943, when orders totaled \$1,360,600,000. Net sales billed increased 5 per cent totalling \$1,353,000,000 in 1944, compared with \$1,288,400,000 the previous year.

Net income for the company in 1944 amounted to \$50,845,719, compared with \$44,922,846 in 1943.

In 1944 the average earnings per

employee at GE reached the all-time high of \$2,772 or \$53.31 per week, compared to \$2,756 in 1943. The company employed an average of 167,212 persons in 1944, compared with 171,-133 in the previous year. Thirty-eight per cent of the company's employees at the end of 1944 were women.

A total of 50,288 employees of GE and its affiliated companies had entered the armed services.

### Company's Sales Reach Peak

• • • Cleveland Graphite Bronze Co., in its annual report to stockholders, stated that sales in 1944 were at an all-time peak of \$58,783,845. The previous high record was \$49,071,212 in 1948.

Net profit of \$1,755,770 for 1944 was reported after all charges, including interest, provision of \$3,720,000 for federal taxes, voluntary refunds of \$4,808,132 to customers and an estimated renegotiation refund of \$6,700,000. While provision has been made for estimated renegotiation refund, the profit figure is necessarily tentative until reviewed by the Price Adjustment Board. The reported profit is equal to \$5.03 a common share and compares with \$1,797,169 or \$5.14 a common share in 1943.

# International Nickel Reorganizes Division

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New York

• • The International Nickel Co., Inc., has established new sections in its Development and Research Division. An Industrial Chemicals Section is to be headed by O. B. J. Fraser; a Corrosion Engineering Section, by F. L. LaQue; and an Iron and Nonferrous Casting Section, by Denald J. Reese.

Mr. Fraser has directed work at Mellon Institute of Industrial Research on problems in the chemistry and technology of nickel, particularly organic derivatives and nickel catalysts. He continues as director of technical service on mill products. The function of the newly created Corrosion Engineering Section will be to serve the interests of customers in the choice and applications of nickel alloys where resistance to corrosion is required. Mr. LaQue has been assistant director of technical service on mill products but since 1940 has been engaged in development of both ferrous and nonferrous nickel alloys.

The Iron and Non-ferrous Casting Section will coordinate development work on cast iron, malleable iron, cast brass, and bronze. Mr. Reese has recently resumed company duties after having been in the Steel Division of WPB for almost three years.

JET ENGINE WORK: Experimental work in the development of jet engines used in the P-80 was carried on in General Electric's Lynn, Mass., plant, while actual production is under way in Syracuse and other plants. This worker is making a machine adjustment for production of an engine part.



94-THE IRON AGE, March 29, 1945

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# Farm Equipment Union Fails to Realize Aims

Chicago

• • • Efforts of the United Farm Equipment and Metal Workers (CIO) representing 20,000 employees of International Harvester Co. to raise and standardize wages in nine plants were balked recently by a directive order of the Sixth Regional War Labor Board. Plants involved in the ruling are located at Chicago, East Moline and Rock Island, Ill.; Bettendorf, Iowa, and Richmond, Ind.

The union's request for a wage increase to recover the rise in cost of living since Dec. 15, 1942, was denied as was a request that starting minimum and general wage rates in various plants be identical with those prevailing in Chicago. The union also failed to make its point that rates for female job classifications should be increased to rates for male classifications, the board holding that adjustment of intra-plant inequities between male and female rates be negotiated as they arose. None of the dozen union requests were approved in full.

General wage increases of 10c. an hr. for skilled employees in the tool and die, experimental and maintenance departments in East Moline, Rock Island, Bettendorf, and Richmond plants were ordered, with a 5c. hourly raise to all other employees in these departments except laborers, truck drivers, and elevator operators.

# Now in No. 1 Critical Labor Classification

Cleveland

• • • Toledo and Youngstown have been classed as Group 1—or critical—labor areas where no new military prime contracts should be placed, according to a recent announcement by Edward L. Keenan, regional director of the War Manpower Commission.

Figures furnished by Mr. Keenan indicative of how the labor situation has tightened in the two areas are as follows: In Youngstown there is a total need in April for 98,804 war workers, representing an increase of 5600 over February, with 4430 required to be males. In Toledo, the April need is 68,866, an increase over February of 3466, with 2287 required to be males. In Youngstown, of course, the critical need is for steel; in Toledo, the critical requirements are for foundry production, ordnance, and aircraft parts.

# UNITED STATES OF AMERICA—WAR LABOR DISPUTES ACT OFFICIAL BALLOT For Employees of The Bitteninous Coal Industry of the United States. MAJOR ISSUES INVOLVED IN THE DISPUTE Ouestions relating to negotiation of a new contract to tolograffect after the old contract expires at midnight, March 31, 1945, and covering wages, hours, and conditions of employment, asket are in the United Mine Workers of Atherica proposals presented by Pollul Committee to the Bitteminous Coal Mine Operators on March 1, 1945. EFFORTS BEING UTILIZED YOR SETTLEMENT OF DISPUTE: On March 1, 1945, a pollowards, soful conference of representatives of the United Mine Workers of a mencagned the Bitteminous Coal Mine Operators convened in Washington, D. Office the purpose of negotiating a new contract. MARK N "X" IN THE SQUARE OF YOUR CHOICE If you spoil your boillot, return it to the Board's agent and obtain a new one DO YOU WISH TO PERMIT AN INTERRUPTION OF WAR PRODUCTION IN WARTIME AS A RESULT OF THIS DISPUTE? YES NO

TOSTRIKE OR NOT TO STRIKE: This is a sample NLRB ballot for the strike vote to have been taken among United Mine Workers at bituminous mines on March 28, three days before the current contracts with operators expires. Ironic part is the U.S. Government asking miners via the ballot "Do you wish to permit an interruption of war production in wartime as a result of this dis-

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# Jack & Heintz Company Awarded New Contract

Cleveland

• • • • A \$1,200,000 contract awarded to Jack & Heintz, Inc., by the Defense Plant Corp. will be used to purchase new equipment and machinery, William S. Jack, president, said recently. This is a preliminary contract, and only a part of a larger one the company is expected to receive.

According to Mr. Jack, arrangements have been made for Jack & Heintz to buy the National Carbon Co.'s plant here, which has about 255,000 sq. ft. of floor space and 25 acres of land adjoining. The building is in escrow.

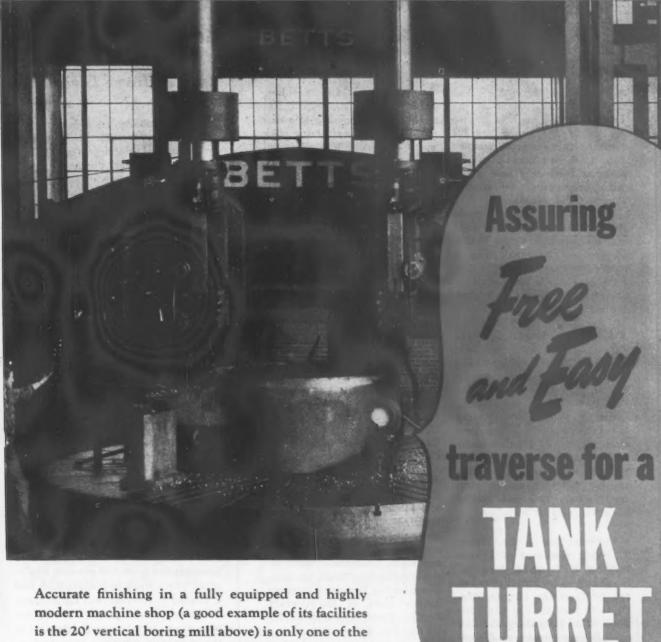
"We will use it to produce parts under a new contract with the Army Air Forces," Mr. Jack said, "and we hope to be in production within a week." The employment ceiling for Jack & Heintz has been raised to allow the company to staff it and about 1500 employees will be needed at the new plant. Some of them are expected to be shifted over from other Jack & Heintz plants.

### Renegotiation Refund Exceeds \$5.8 Billion

Washington

• • • Refunds of more than \$5,800,-000,000 of excessive profits have been made or agreed upon as a result of renegotiation of war contracts in the last three years, according to Col. Maurice Hirsch, chairman of the War Contracts Price Adjustment Board. The cash refunds, he said, reflect for the most part the renegotiation of prices for the business of contractors in 1942 and 1943. Renegotiation for business in 1944, it was pointed out, has just begun.

"The cooperation given by contractors to those administering the Renegotiation Act is well evidenced," Colonel Hirsch said, "by the record of renegotiations for 1943 which have been completed up to March 9, 1945, the most recent date for which full data is now compiled. As of that date the cases of more than 31,500 contractors had been reviewed for that year, in 24,395 of which no refund was required either because of the non-applicability of the act or because no excessive profits appeared to have been realized. In over 7000 of these cases, refunds were made under voluntary agreements entered into by the contractors.



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THE IRON AGE, March 29, 1945-97

### Industrial Briefs . . .

• GENERATOR OUTPUT — The Ypsilanti, Mich., plant of the Ford Motor Co. has been in production of P-1 generators for combat planes and bombers since Jan. 1, it has been disclosed, and has received a new Army Air Forces order for several thousand R-1 generators.

The R-1 weighs 2 lb. more than the old type, of which Ford manufactured more than 76,000, turning out 300 amp. with a maximum speed of 8000 r.p.m. The new contract necessitates a 60 per cent increase in production schedules.

- WPB AUTHORIZATION—Budd Wheel Co., Detroit, has been authorized by the WPB to build a \$2,350,000 addition to its Detroit plant to produce divided rim type wheels for trucks, which the services are adopting to enable trucks to negotiate chuck holes and road obstacles with reduced danger of punctures or blowouts. In addition to the building, an elevator, transformers and cold rolling mills will also be installed.
- CONTRIBUTION Dr. Henry T. Heald, president of Illinois Institute of Technology, recently announced an initial grant of \$15,000 from the Ohmite Mfg. Co. to be used for the establishment of a laboratory for the precision measurement of electrical and magnetic quantities.
- New Setup—Armco Spiral Welded Pipe has been sold through Armco Drainage & Metal Products, Inc., Middletown, Ohio, a wholly-owned subsidiary of the American Rolling Mill Co., according to the parent company. The new commercial arrangement consolidates all Armco pipe and fabricated product activities in one organization.
- R. C. Beam has been named manager of the sales division of Armco Drainage & Metal Products, Inc., and R. E. Walker has been made district manager of sales. Mr. Walker will continue to be located in Tulsa, Okla.

- OPENS SALES OFFICE Despatch Oven Co., Minneapolis, has announced the opening of a new sales and field engineering office in the La Salle Wacker Building, Chicago.
- APPOINTS JOBBERS The appointment of nine new jobbers to handle the line of ARO industrial pneumatic tools manufactured by the Aro Equipment Corp., Bryan, Ohio, has been announced recently.

These include The Hawley Hardware Co., Bridgeport, Conn.; Continental Cutter Supply, Brooklyn; Guarantee Specialty Co., New York; The Sager-Spuck Supply Co., Albany, N. Y.; Utility & Industrial Supply Co., Jackson, Mich.; The Lowery Co., Bay City, Mich.; Cutting Tools & Supplies, Pontiac, Mich.; The A. J. Glesener Co., San Francisco; and The Campbell Hardware & Supply Co., Seattle, Wash.

• SAE RESEARCH — Organization of a special aircraft projects subdivision of the Aeronautic Division, Society of Automotive Engineers, to undertake coordinated research and development in fundamental aeronautical engineering fields, has been announced by Division Chairman Arthur Nutt of the Aircraft Engine Division, Packard Motor Car Co., Toledo, Ohio.

The subdivision already has initiated four projects. They are: Development of a standard aeronautical drafting room practice manual; test procedures and design requirements for helicopter powerplants, transmissions, and drive mechanisms; standardization of inspection stamps and symbols used in the aircraft manufacturing industry; and aircraft engine cold starting requirements.

• New Quarters — The Bone Tool & Gauge Co. has recently moved from its old plant into enlarged quarters at 9910 Freeland Avenue, Detroit. These new quarters have increased manufacturing facilities considerably.

### See Greater Use Of Stainless Steel For Airframe Engineering

### Chicago

• • • Availability has been an important determining factor restricting wider use of stainless steel in airframe engineering during the war, V. N. Krivobok, development and research department, International Nickel Co., told the Chicago chapter of the American Society for Metals recently.

Wider use is probable in the future, however, he declared. Citing a recent survey of aircraft plants, Dr. Krivobok said that 25 out of 32 reporting classed stainless steel as the nominal structural material in their planes at present. Of the 25, 12 stated they intended to increase its utilization by at least 50 per cent in the future. He expressed the opinion that it would not replace present materials.

As a major consideration in fighter plane design, it was said that only 20 per cent of a plane's total weight is subject to weight reduction through lighter or improved materials. Every material has special properties which are utilized, he pointed out.

Contrary to popular belief the strength-weight ratio of a material is not the only consideration in design, or else stainless would have wider application, he indicated. A major design consideration is that 60 per cent of airplane parts work in compression and a number in torsion; thus rigidity and resistance to compressive forces are important. In this regard, attention to the method of rolling is important so that rigidity will be achieved through properly arranged congregations in all directions.

In advanced plane design, particularly in the jet field, increased demand for materials to be used at elevated temperatures points to a greater use of stainless. Continuous subjection to temperatures of 400 to 500 degrees is common in new design trends. At these temperatures many physical properties of stainless are increased.

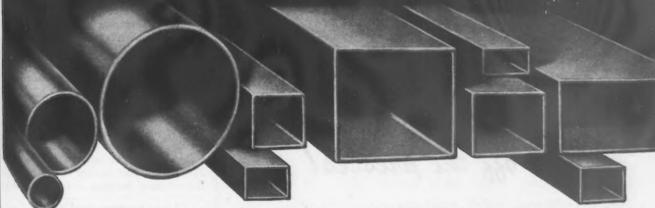
Krivobok also criticized, in determining materials to be used on the basis of formability, the common judgment of ductility upon the basis of elongation in 2 in. This arbitrary gage may be misleading, for there is an entirely different distribution in one-quarter inch, which is the maximum in many forming operations.

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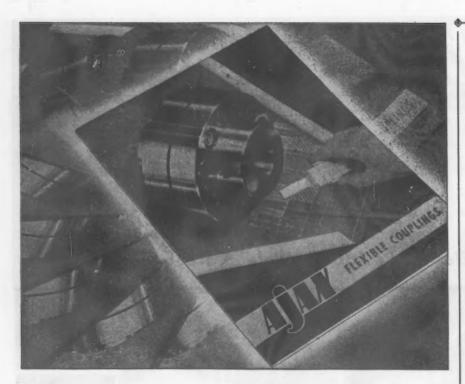
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### -FEATURE CONTINUATION.

### **Shot Peening**

(CONTINUED FROM PAGE 49)

which has initiated at the base of a spline tooth is shown in Fig. 19. This later photograph was not taken from quills of the type shown in Fig. 18 but is an example of a condition which shot peening will improve.

### Tempering After Peening

The torsional and bending elastic limit values are sometimes decreased due to shot peening. This is also particularly noticeable on hard drawn carbon steel wire and may influence the set characteristics of the spring in some applications. To improve these elastic limit values a low temperature tempering treatment is applied. Zimmerli¹ shows in Fig. 20 how such treatment influences the fatigue instance. All the beneficial effect of peening is lost at a temperature of 825 deg. F.

Further example of a mild heat treatment was reported<sup>14</sup> on S.A.E. 1045 steel, normalized and tempered, which had been surface rolled with rollers similar to that shown in Fig. 17. After a mild temper of 525 deg. F. the rotating bending endurance limit

h Chrome-vanadium steel quenched and tempered to Rc46. Decrease in diameter due to rolling was less than 0.0008 in. k L. E. Simon, chief metallurgist, Electro-Motive Division, General Motors.

was increased by 6 per cent and the elastic limit improved over that obtained with no tempering treatment

An improvement in the elastic limit is also accomplished by scragging springs. This is another form of cold work obtained by the common commercial practice of deliberately overloading the spring so as to produce a permanent set or deflection. On chrome-vanadium coil spring Manteuffel19 showed that in some cases this scragging lowered the fatigue strength somewhat and in others a slight increase was obtained. Prever and Locatis also found that prestressing gave a slight increase on helical springs made from drawn wire. Or leaf springs subjected to bending loads Becker and Phillips" obtained a great er improvement, namely from 56,000 lb. per sq. in. to 73,900 lb. per sq. in or 32 per cent.

Parts of high hardness having sharp corners are sometimes given a low temperature stress relieving treatment after shot peening to prevent the corners breaking off.

Ed. Note:—Next week the author concludes this appraisal by examining the control of shot peening, peening steel and light alloys, shot size and time



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### FEATURE CONTINUATION.

peening of gears, and gun parts, crank shafts, and studs and bolts, and liquid blast.

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### 1,000 Combinations

of voltage and amperage are available with Hobart Multi-Range Dual Control.

### Remote Control

enables operator to select the correct welding heat for various procedures without returning to machine.

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is easy with Hobart. Just flip a switch for reverse or straight when desired.

HOBART WELDING ELECTRODES

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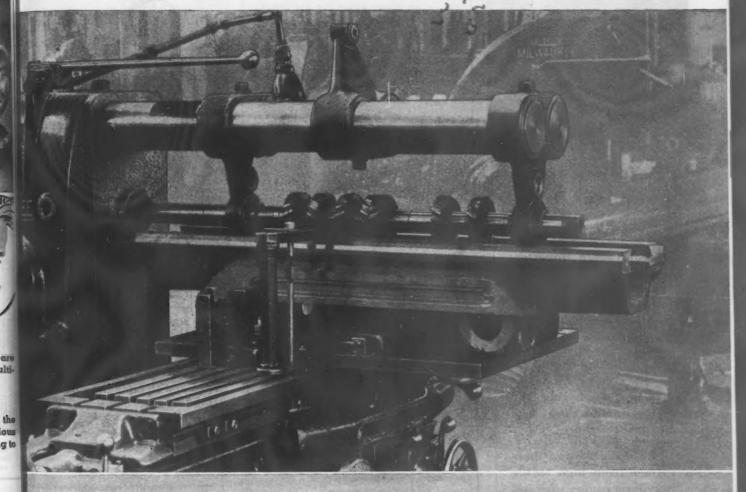
HOBART BROTHERS CO. BOX IA-335, TROY, OHIO



104-THE IRON AGE, March 29, 1945

TO MILL IT ... WITH .. PRECISION ... PROFIT

UT IT ON A



Five side-milling cutters and one pair of interlocking side-milling cutters are mounted on a special 51-½842 Milwaukee Arbor held in the spindle of a Milwaukee 4H Milling Machine. Two arbor

the petter oday.

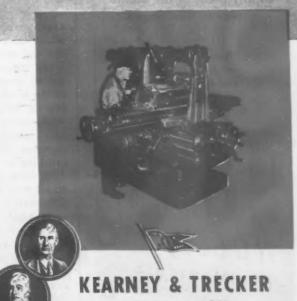
CO. OHIO braces support the arbor while a third increases overarm rigidity. Seven faces are straddle milled simultaneously in this set-up in which the knee is fed vertically.

Taking the tough jobs in stride — setting the pace in production milling - standing up with precision performance through the years - these qualities have made "Milwaukee" a top ranking name in milling machines.

Their ability to crack many a milling problem is reflected in the popular expression of machine tool men-"put it on a Milwaukee." Time-tested, production-proved, modern in every detail of design and construction but free of frills and novelties Milwaukee Milling Machines yield the sustained performance — with precision and speed — that spell profit in milling operations.

Select your milling equipment from the Milwaukee line of more than 70 models - the PoweRated Milling Machines - every machine engineered and built with ample power for every class of job.

Milwaukee Machine Tools



CORPORATION

MILWAUKEE 14, WISCONSIN



### Better not run out of gas here!

• The fuel gage of a tank is a bit more important than the one on your late '41 model for it must give precise indication of the fuel level under all operating conditions.

Its calibration depends on the accuracy and permanence of a spring held to unusually close load and rate tolerances.

We make a lot of these springs from high tensile Beryllium copper wire and supply them to the manufacturers of fuel gages.

> Phone Holly 2211 or from Detroit dial Cherry 4419



### FEATURE CONTINUATION\_

### Centerless Grinding

(CONTINUED FROM PAGE 55)

permissible minimum, and finally the root of the thread would be broader and the minor diameter near the permissible maximum. In both cases the root is rounded as the crests of the ridges on the grinding wheel do not retain sharp edges for any length of time.

Compared with commercial set screws, the following statements can be made for the set screws ground on the centerless thread grinder:

ne centerless thread grinder:

(a) The lead error is reduced and may be 0.0005 in. in 1 in. or less depending on the rate of production. Reduced speed through the machine reduces the error. Tests have produced results where error is 0.0001 in. per in.

(b) In all cases where the major diameter of the screw is ground throughout the length of the screw, the pitch diameter is constant and concentric with the major diameter.

(c) The major diameter is constant throughout the length of the screw under conditions mentioned in (b), even though the blank is tapered initially.

even though the blank is tapered initially.

The sides of the threads are smooth and straight.

The angle is as accurate as the angle of the crusher grooves.

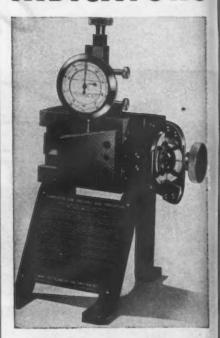
### Crushing the Grinding Wheel

Formation of the annular ridges on the grinding wheel by means of crushing has the following advantages: (1) It saves time; (2) the crusher may be used several times before replacement is required, and (3) the cost of the crusher is low, especially in terms of the production obtained.

The grinding wheel requirements are such that the wheel must permit crushing, that is, either the bond must break down or the friable grit particles must split under the crushing pressure. It is probable that a combination of both actions occur. The action of the crushing is severe on the wheel as well as on the crusher. However, grinding wheels are produced which can readily be formed by crushing and which will retain strength of wheel structure to maintain the required groove form. A shorter life of the wheel form immediately following an initial crushing from a solid wheel can be expected. Production of only about 2000 screws can be expected whereas after a second crushing of the wheel, removing only 0.003-0.004 in. from the radius of the wheel with less crushing pressure, approximately 6000 screws may be ground before another crushing is required. Following a third crushing the wheel groove form will permit a production of about 12,000 screws. It is believed therefore that the form life on the wheel varies inversely with the length of time of crushing; that

# Clarkator

### CHECKS DIAL IDICATORS



**MICROMETER** speed with sine bar precision—the fastest, most accurate method ever developed for checking dial indicators! Clarkator gives 100% inspection on every vital point. Checks comparators, hardness testers and all other instruments requiring precision dial indicating.

The Clarkator is sturdily built for long trouble-free service. Easy to operate-just four simple steps! Complete operating instructions are permanently attached to base.

Be sure of absolute accuracy of indi-cator readings. Put Clarkator to work for you. Regular use will provide a

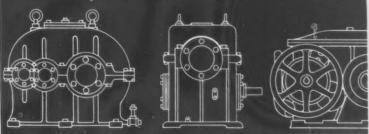
saving in test re-sults alone worth many times its low cost! Illustrated 2-color circular contains complete escriptions and specifications of the Clarkator. Write for your today! free copy Dept. IA.

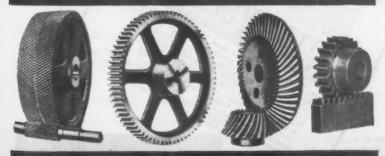


INSTRUMENT, INC. 10200 Ford Rd., Dearborn, Mich.



# Brad Foote Gears





### SPEED REDUCERS

There is a Brad Foote Speed Reducer to fit every need. Made in all sizes—all horse powers—any ratio—all tooth forms.

### SPECIAL GEARS

Brad Foote special precision cut gears are fitted for installation on the most exacting jobs. Made in all sizes from any practical material in all tooth forms—Herringbone—Helical—Bevel—Worm and Gear—Spiral Bevel and Spur.

Over a generation of experience goes into every Brad Foote product and extensive plant capacity and shop equipment assure prompt delivery of great quantities of smooth running quality gears.

Write us about your geared reduction problem — full information will be promptly sent you.





BRAD FOOTE GEAR WORKS
1309 SO. CICERO AVE. CICERO 50, ILL



RECENTLY completed studies, embracing availability of raw materials, markets in the Southeast, and labor trained in many metal working trades, show outstanding opportunities in Alabama for plants making these commodities. The Southeast consumes a minimum of \$3,000,000 annually of each of these products:

Agricultural machinery; aluminum ware-kitchen and household; bolts, nuts, washers and rivets; blast furnace products; exhaust and ventilating fans: fabricated structural steel; insulated wire and cable; internal combustion engines; laundry equipment; lighting fixtures; office furniture (wood and steel); power boilers and ass'd. prod.; screw machine prod. and wood screws; sheet metal work; steam and hot-water heating apparatus; stoves and ranges (electric); textile machinery; tractors.

Pig iron, steel, aluminum available in practically unlimited supply. Also low-cost power, cheap fuels, excellent distribution facilities from South's center to growing markets.

Specific studies will be made on request to-Dept. I

ALABAMA
STATE PLANNING BOARD

is, that the longer the crushing action is applied, the weaker is the wheel structure adjacent to the surface. This condition is particularly evident when the grinding wheel is made of 220 grit or finer.

A grinding wheel which has been grooved should be kept on its wheel center when removed from the machine and another wheel on a new center mounted in the machine when a different pitch of screw is to be ground. In this way considerably greater overall production or life per wheel is possible.

### Root of the Thread

Since the root form of the threads ground on the centerless thread grinder is determined by the crest of the ridges on the grinding wheel, it is obvious that the crest shape for any given pitch is dependent upon the size of the grain used in the wheel. A crest, 0.004 in. wide, would be difficult to obtain with a grinding wheel having a grain size of 100, inasmuch as the average dimension through such a grain particle would be just a little less than 0.010 in. In order to grind screws having the desired width

at the root of the thread, the grain size of wheels has been considered and a tentative table of recommended grain sizes for various pitches of screws prepared:

Screw		Wheel
Size	Pitch	Grain Size
No. 4	40	400
No. 5	40	400
No. 6	32	320
No. 8	32	320
No. 10	28	320
No. 12	24	320
1/4 in.	20	220
5/16 in.	18	220
% in.	16	180
½ in.	13	150
% in.	11	150

Very soon after crushing, the form of the threads ground on the centerless thread grinder shows a root with a round bottom. Particularly with the screw threads of ¼-20 size and smaller, does the round bottom become noticeable immediately after crushing. (See Fig. 7.) In view of the decided trend away from sharp corners of the flat at the minor diameter of the screw, the results obtained are advantageous and will serve to simplify production of the round bottom in certain applications where the fatigue strength of the screw is involved.





# E AUST STOPS

\$1,000,000,000 per year-one thousand million dollars . . . that's RUST'S annual "loot" from industry!

Your share? Actually, it's a lot more than you think-whatever your type of production. For Rust's "loot" is measured in depreciated machinery . . . in wasted time and materials . . . plus losses you can't even begin to calculate.

There's only one way "out." That's . . . Stop Rust before it starts! Stop it before it stops you.

Use Shell Tellus Rust-Preventive Oils to lubricate machines, wherever moisture is a factor. These Shell developed and perfected oils possess special rust-inhibiting qualities and, therefore, provide protection against the formation of rust. Further-

more, these oils have been developed without sacrifice in other important characteristics.

Use the new Shell Ensis Rust-Preventives as protective coatings. They come in a complete line of oils, fluids, and compounds. The protective coatings formed range from thin, transparent oil films for use between machining operations to heavy, abrasion-resistant surfaces that stand up against weather and time.

Call the Shell man now. Let him study your operation, show you how to "stop rust!" Write, wire, phone: Shell Oil Company, Inc. 50 W. 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, California.



...OILS...FLUIDS...COMPOUNDS

# How much are You paying

# FOR INDUSTRIAL TRUCK MAINTENANCE?



# compare Your Costs WITH THESE:

The rugged construction of Baker Trucks, and the easy accessibility of all parts requiring service, result in unusually low maintenance costs. The following actual records are typical of many where regular inspection and lubrication are a matter of routine.

A midwestern railroad paid a total of \$144.70 for replacement parts for two Baker Trucks which were in continuous service over a period of 7 years, 4 months—an average of only 82c per month per truck.

A large motor truck manufacturer with a fleet of Baker Trucks, reports that during the last 5 years the total maintenance expense, on a truck purchased 26 years ago, exclusive of tires, has not exceeded \$50.00 per year.

A large aircraft parts manufacturer bought 11 Baker Trucks 3 years ago for his huge new plant. Trucks operate 24 hours a day under most severe conditions. During the last 12 months (3 years of normal service) maintenance costs averaged \$350.00 per truck—a remarkable record considering that they had seen the equivalent of 9 years of gruelling, uninterrupted service.

A wire mill reports that their Baker Truck, purchased in 1918 is still in regular service, and that maintenance cost-exclusive of tires-has been less than \$50,00 per year for the last 5 years.

A food canner using a Baker Hy-Lift Truck purchased in 1931, writes: "Our superintendent tells us that surprising as it may seem, no new parts are necessary. Your representative told us what adjustments could be made—and it seems that they could do it right at the cannery. It looks like this is just one more blue ribbon for Baker. It is amazing that after all these years a general replacement of essential parts is unnecessary."

A brass fitting manufacturer reports that his 4 Baker Trucks, in continuous service for 3 to 5 years have required no overhaul—and factory replacement parts, exclusive of tires, have averaged about \$10.00 per year per truck.

A Baker Truck operating nearly four years in the plant of a transportation equipment manufacturer, has needed no major overhaul. Maintenance costs, in spite of severe service conditions, have totaled only \$150.91-less than \$40.00 per year

To help you reduce maintenance costs on your individul trucks, write for "Industrial Truck Care Pays You Dividends."

BAKER INDUSTRIAL TRUCK DIVISION of The Baker-Raulang Company

2175 West 25th Street • Cleveland, Ohio

In Canada: Railway and Power Engineering Corporation, Ltd.

# Baker INDUSTRIAL TRUCKS

### Diesel Gas Engine

(CONTINUED FROM PAGE 61)

from oil to gas, or vice versa, or even to maintain a mixture of the two where there is insufficient gas to pull the load. Such controls are available.

There are hundreds of installations of diesel engines, or of gas engines. which have been installed as convertible units, because of the uncertainty of the particular fuel they are using. Aside from changing from an electrical ignition system to a fuel oil system or vice versa, the usual means of convertibility is by change of pistons, or of cylinder heads, or by means of spacers under the cylinder heads which will increase compression space when converting to gas. The change obviously requires considerable time and involves expensive parts. With the new system all this expense is obvi-

# Boost in Gas Capacity Will Aid War Plants

Youngstown, Ohio

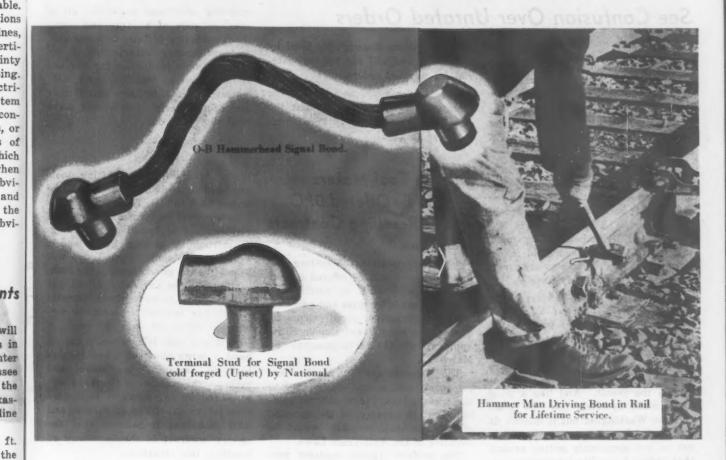
o o Youngstown war plants will probably have fewer interruptions in their natural gas supply next winter as a result of plans of the Tennessee Gas & Transmission Co., to boost the capacity of its new 1265-mile Texas-West Virginia natural gas pipeline about 30 per cent by Nov. 1.

Now bringing in 200,000,000 cu. ft. of gas daily from southern Texas, the line supplements West Virginia and Ohio supplies sold by the East Ohio Gas Co., and other gas companies in the area. The company plans to build four compressor stations and the War Production Board has certified the project to the Defense Plant Corp., making DPC funds available for financing the line.

Approval was also given the company for a 140-mile 24-in. pipeline in Texas to cost \$7,000,000, but Youngstown plants will not share in the orders because the pipe is too large in diameter for any of the Youngstown pipe mills.

Interruptions in gas service have hit local steel plants and fabricators this winter particularly, since they were also short of standby fuels to which they could normally turn. The big Cleveland storage plant recently destroyed by fire was designed to prevent such shut-downs and industrial companies here are the first to be shut off from gas service in cold weather because their contracts provide for lower rates.

# Can You Give Us a Tougher UPSET Job Than This?



Here's a piece of metal that really takes a beating. It's the terminal stud for Ohio Brass Company's Hammerhead Signal Bond. It must withstand first a severe assembly operation in the plant, then a lusty blow on the head when it's driven into the rail, and finally, the constant vibration throughout the lifetime of the rail as the trains thunder over it.

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When production needs for this stud could not be met by hot forging, Ohio Brass put it up to National Screw. It was a very difficult part to upset, particularly with the necessity of procuring perfect grain flow and tempering to prevent difficulties in final assembly and reforming. We worked out a method of upsetting from round wire, solving the problem of securing volume while at the same time reducing the cost.

Few upsetting jobs are as tough as this one, but we cite it to show you what unusual things can be done where unusual experience, ingenuity and facilities are at your service.

> Have you seen our "Savings" booklet? If not, please write for a copy.



THE NATIONAL SCREW & MFG. CO., CLEVELAND 4, O.

# MACHINE TOOLS

. . . News and Market Activities

### See Confusion Over Unrated Orders

### Cleveland

• • • Machine tool makers here, most of whom have a sizeable percentage of unrated orders on which there have been relatively few cancellations, are wondering how they are going to get urgently needed machines through under the existing priority setup.

Right now, some of the unrated orders on the books are for war work but were received at a time when the powers that be were not rating orders if they didn't have to. Back in November and December, for example, the WPB Tools Division said in essence: "We won't give a priority rating unless we absolutely have to."

In the present crisis, builders say to their customers, "get us a rating." But when the customer goes to the district office and is informed that ratings cannot be had, simply in some cases because district offices are afraid to issue them, the present situation is the result. And like a good many other systems, this one is all right in Washington but it doesn't fit all the district offices where word has not as yet apparently gotten around that orders for critical programs are to be rated regardless of their original

As this is being written, discussions are being held in Washington to speed up instructions to the district offices, since it seems quite definite that local offices in the past have not gotten the significance of instructions for some time. Machinery is set for getting ratings and the customer can always appeal to the Tools Division in Washington or his procurement service and perhaps get the rating. But somebody has to look into these things and it is this requirement that slows things

In the present situation, unless ratings are given or priorities granted for some of the unrated orders, many essential machine tools are not going to find their way into customers' plants and will be sent someplace else. Also, machinery production will be reduced that much because it is virtually impossible to get allotments of material for unrated orders. If, on his books, the machine tool builder has 20 or 30 per cent of his order unrated,

the scrutinizers discount his total by that much and will not release material for unrated orders.

One builder here, wearied by the situation, said that he felt that the government was not very keen about granting additional materials, all of which is part of a large and sometimes confusing picture, with one government agency conscientiously demanding more production for war and another, just as conscientiously, telling machine tool builders that if they can't get material they should make what they have do.

0 0 0

### **Cutting Tool Makers** Will Be Offered DPC Reselling Contracts

Washington

• • • Approximately 235 cutting tool manufacturers will be offered agency contracts with DPC to resell tools originally made by them and now surplus to government requirements as Surplus Property Board announced its approval of the arrangements on March 24.

The Department of Justice has previously said it was not opposed to the transactions, but would not commit itself in advance on the question of whether such contracts would be violative of the Anti-Trust Laws.

The uniform agency contract pro-

vides that all surplus cutting tools produced by a manufacturer shall be turned back to him. The original manufacturer will be reimbursed by DPC for the cost of handling, reworking, reconditioning, storing goods and a 17½ per cent selling commission will be paid by the government to the manufacturer if he agrees to fill 25 per cent of his demand from surplus stock. The contract is mutually terminable within 10 days' notice.

SPB said that DPC already has on hand a large stock of these surplus tools in varying types, sizes, and makes. The collapse of Germany will cause the owning agencies to declare even larger quantities as surplus and SPB said that it believes that the agency contract is the best way of handling this situation.

### Warner & Swasey Net Drops in Year

Cleveland

· · Net profit of the Warner & Swasey Co. for the year ended Dec. 31 has been reported at \$502,358, equal to 62c. a share, compared with \$1,696,270, or \$2.10 a share in 1943. Net is after amortization of emergency facilities, interest, and taxes, and is subject to renegotiation. Renegotiation proceedings for the years 1942 and 1943 have not been con-

Net sales for 1944 amounted to \$23,908,328, compared with \$50,969,-974 in the previous year.

Charles J. Stilwell, president, in his remarks accompanying the annual report, said that 1944 was a year of conversion from the company's standard production of machine tools to the direct production of war materials. "Such conversion is an expensive operation, as will be evident from the report for the year," he added.

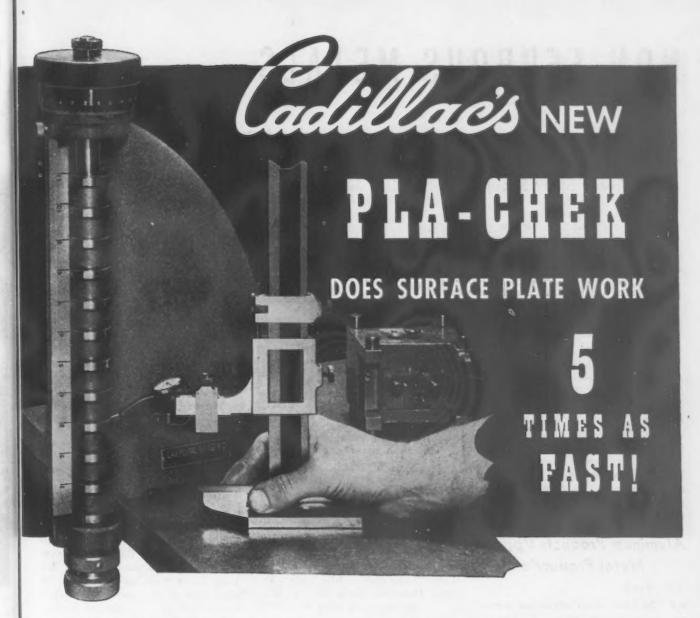
Mr. Stilwell reported that most of the difficulties of conversion have been overcome, and during the latter part of the year it was possible to ship sufficiently increased quantities of critical munitions items to convert the very considerable loss incurred in the first seven months into a final profit for the year.

### Labor Shortages Cut Output

Cincinnati

• • • Although plant operations in the area are at capacity under present labor forces, the actual output is below the peak figures because of labor shortage. The steady diminution of employment because of the draft as well as ordinary causes has decreased plant forces in some cases as much as 40 per cent from the figures at the high point in business production.

114-THE IRON AGE, March 29, 1945



WITH Cadillac's new Pla-Chek you can get out five times as much surface plate inspection work as you do now—and it will be accurate because Pla-Chek is guaranteed accurate to .00005".

f

ely of

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Pla-Chek is a hardened steel bar with 12 steps spaced exactly 1" apart; a micrometer screw thread ground on the lower end; a large micrometer thimble graduated in .0001" on the upper end of the bar and a simple triangular-shaped support bracket.

With this bracket set on a conventional surface plate and the micrometer thimble set at

zero, the lower end of the bar is exactly level with the surface plate.

The micrometer is then set for the desired dimension in thousandths and tenths of thousandths and the measurement is taken from the desired inch step. Measurements are guaranteed accurate to .00005" for any size from .001" to 12" from the surface of the plate.

### TWO WEEKS FREE TRIAL

So that your inspectors can see how much time Pla-Chek will save them, we will send it on two weeks free trial. If this trial satisfies you, send your check, if not, return Pla-Chek express collect and you owe us nothing.

Cadillac GAGE COMPANY

DETROIT 5, MICHIGAN

# NON-FERROUS METALS

. . News and Market Activities

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# Report Ferroalloys Now in Short Supply

New York

• • • It is reported that current orders for ferrochromium represent a greater demand than can be shipped immediately from stock. However, producers of ferroalloys point out that there is plenty of ore on hand and that orders placed now must take their turn for future delivery just as is the case in current orders placed for steel products.

Shortage of ferrochromium may possibly require restriction in the use of stainless steel during the second quarter largely to jet propulsion engines and welding rods for armor plate, although there is nothing official yet to confirm this view.

A similar development in ferrotungsten may require the substitution of molybdenum tool steel for the tungsten steel of standard 18-4-1 composition.

### Aluminum Products Up, Metal Production Off

New York

• • • In 1944, total aluminum products shipments established an annual record of close to 2.5 billion lb., about 15 per cent more than 1943, according to statistics released by the Aluminum and Magnesium Division of WPB. Primary production for the year was cut back by almost 300 million lb. to total 1553 million lb., while secondary recovery exceeded 626 million lb., 20 per cent greater than 1943.

Total shipments of aluminum to CMP consumers in December were lower than any month since February, 1943. The 165 million lb. shipped in December was 29 per cent less than the peak of 232 million lb. for March,

1944. This will probably be the low point in aluminum operations for many months in view of resumption of large military demands for sheet, extrusions and other products in 1945.

While the demand for aluminum products for December delivery declined, except for sheet, strip, plate

### Heikes Leaves WPB

Washington

• • Nigel H. Bell has been named director of the Aluminum and Magnesium Division, succeeding George C. Heikes, WPB announced March 26. Mr. Heikes said he was resigning to return to private industry. Mr. Bell who has been with the division since November, 1942, has recently served as chief of the Fabrication Branch.

and foil, the largest drop took place in ingot, powder and paste with a total of 22 million lb. shipped, in comparison with 59 million lb. in November.

Production of virgin aluminum increased 5 per cent to 93.7 million lb. during December. Less than 47 million lb. was recovered from secondary metal.

### Aluminum Scrap Weak

New York

• • • Aluminum scrap continues weak with some ingot producers in this area out of the market for most grades, holding reasonable inventories and looking for further developments based on advances of our armies in Europe. Dural alloys are said to be extremely plentiful but low-copper alloys are not offered in large quantities.

# Starts Production Of Aluminum Bridge Parts Grand Rapids, Mich.

Production has begun on roadway sections of pontoon bridges for

way sections of pontoon bridges for the services by the Grand Rapids Aluminum plant of Extruded Metals, Inc. Initial operations began with a force of 200 which will be gradually increased to 600, employed in the aluminum casting shop, the extrusion press department and the finishing department.

It is expected that extruded airplane parts will be produced later at this plant, which has been idle since earlier war orders were cancelled.

# Aluminum Extrusion Production to Expand

Washington

• • • The objective for June production of aluminum extrusions, principally for aircraft and bridges, calls for an increase of 65 per cent over February, the Aluminum Labor Advisory Committee has been told. A large part of the increased production is required for expanded production of floating bridges. Lieut. Col. N. O. Kraft, Chief of the Aluminum and Magnesium Section of the Army Service Forces, cited the new M-4 bridge as a critical item. The bridge is made almost entirely of aluminum and can carry eight times the load that floating bridges of the last war could carry.

The labor advisory committee analyzed the production and manpower problems in the aluminum extrusion industry, plant by plant and unanimously urged a 7-day week.

Production of aluminum sheets is satisfactory, WPB officials said. Director George Heikes of the Aluminum and Magnesium Division said that output will probably exceed earlier estimates by 48 million lb. in the first quarter. He attributed the rise in production to cooperation between WPB, WMC, Army, Navy, management and labor, since committee members had made plant-by-plant suggestions for the increase in production to meet expanded requirements.

Aluminum Metal Production, Millions of Lb.

	Year	Total	Primary	Secondary
1943		2,360.7	1,042.2 1,839.7 1,552.8	370.4 521.0 626.2

Aluminum Fabricated Product Shipments, Millions of Lb.

Year	All Shapes	Rod, Bar, Wire & Cable	Sheet, Strip, Plate & Foil	Rolled & Ex- truded Shapes	Cast-	Forg-	Tub-	Rivets	Ingot Powder and Paste
1942	 1,398.9	98.3	540.4	84.7	324.1	123.3	32.1	17.0	179.0
1943	2,170.6	146.4	841.0	130.9	460.5	262.9	44.7	28.4	255.8
1944	 2,488.8	127.5	897.8	143.3	514.9	269.7	46.4	24.3	464.6

### Primary Metals

(Cents per lb., unless otherwise noted)
Aluminum, 99+%, del'd (Min.
10.000 lb.)
Antimony, American, Laredo, Tex. 14.50
Beryllium copper, 3.75-4.25% Be;
dollars per lb. contained Be\$17.00
Cadmium, del'd 90.00
Cobalt, 97-99% (per lb.) \$1.50 to \$1.57
Copper, electro, Conn. valley 12.00
Copper, electro, New York 11.75
Copper, lake
.Gold, U. S. Treas., dollars per oz. \$35.00
Indium, 99.9%, dollars per troy oz. \$4.00
Iridium, dollars per troy oz\$120.00
Lead, St. Louis 6.35
Lead, New York 6.50
Magnesium, 99.9 + %, carlots 20.50
Magnesium, 12-in. sticks, carlots. 27.50
Mercury, dollars per 76-lb. flask,
f.o.b. New York \$163.00 to \$168.00
Nickel, electro
Palladium, dollars per troy oz\$24.00
Platinum dellars per troy oz
Platinum, dollars per oz \$35.00
Silver, open market, New York,
cents per oz
Tin, Straits, New York 52.00
Zinc, East St. Louis 8.25
Zinc, New York 8.65

### Remelted Metals

(Cents per lb. unless	3	0	13	10	7	Ø	ŝs	16		91	10	ted)
Aluminum, No. 12 Fdy	. (	N	la	. !	2)	9	1	01	0	t	0	10.00
No. 2, 3, 4					-	8 6		0	0	*	0	9.50
Brass Ingot												
85-5-5-5 (No. 115)							0			0		13.25
88-10-2 (No. 215)												16.75
80-10-10 (No. 305)												
No. 1 Yellow (No.	4	0:	5)		0 1			0		0	0	10.25

### Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded		
	Shapes	Rods	Sheets
Copper	20.87		20.37
Copper, H.R		17.37	
Copper drawn		18,37	
Low brass, 80%		20.40	20.15
High brass			19,48
Red brass, 85%		20.61	
		19.12	24.50
Naval brass			
Brass, free cut		15.01	****
Commercial bronze,			
90%		21.32	21.07
Commercial bronze.			
95%		21.53	21.28
Manganese bronze .			28.00
Phos. bronze, A, I			.0.00
		36.50	36.25
5%			
Muntz metal	. 20.12	18.87	22.75
Everdur, Herculoy.			
Olympic or equal		25.50	26.00
Nickel silver, 5%		28.75	26.50
Architect bronze			

### Aluminum

(Cents per lb., subject to extras on gage, stze, temper, finish, factor number, etc.)
Tubing: 2 in. O.D. x 0.065 in. wall 2S.
40c. (½H); 52S, 61c. (O); 24S, 67½c. Tubing: 2 in, O.D. x 0.065 in, wall 2S, 40c,  $(\frac{1}{2}H)$ ; 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52s, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

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n -1The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price: 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.: ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in.

22°. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in thick by 1.001-2.000 in wide, 33c. per lb.; 0.751-1.500 in thick by 2.001-4.000 in wide, 29c.; 1.501-2.000 in thick by 4.001-6.000 in wide, 27 ½c.

### Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations Meta-turnings: 100 lb. or more, 46c, a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

### NONFERROUS SCRAP METAL QUOTATIONS

†(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)

### Copper, Copper Base Alloys

OPA Group 1†	
No. 1 wire, No. 1 heavy copper No. 1 tinned copper wire, No. 1	9.75
tinned heavy copper	9.75
Copper tuyeres	8.75
Copper borings	9.75
Lead covered copper wire, cable	6.00
Lead covered telephone, power cable	6.04

### OPA Group 2†

Bell metal	15.50 13.25
Low lead bronze borings	11.50
	10.00
High lead bronze borings	10.0
	10.7
	10.5
Copper-nickel solids and borings	9.2
Bronze paper mill wire cloth Aluminum bronze solids	9.5
Soft red brass (No. 1 composition)	9.0
Soft red brass borings (No. 1) Gilding metal turnings	9.0
Contaminated gilded metal solids.	8.5
Unlined standard red car boxes	8.2
Lined standard red car boxes Cocks and faucets	7.7
Mixed brass screens	7.7
Red brass breakage	7.5
Copper lead solids, borings	6.2
Yellow brass castings	6.2
Automobile radiators	7.0
Zincy bronze solids	8.0
OPA Group 3†	

Fired rifle							
Brass pipe							
Old rolled							
Admiralty							
Muntz met	al conde	nser	tut	es		*	7.0
Plated bra							
Manganese	bronze	solid	ls .				. 7.3
Manganese	bronze	solid	la .		 		6.2
Manganese	bronze	bori	ngs				. 6.5
		bori					

### OPA Group 4† Refinery brass ...

*Price	varies	with	analysis.	1 Lead	con-
tent 0.00	to 0.4	0 ner	cant ST	and con	ntont

0.41 to 1.00 per cent.

### Other Copper Alloys

Briquettea	Cartridge	Brass	Turn-	
Cartridge	Brass Tur	nings,	Loose	8.625 7.875
Loose Yell	low Brass	Trimmi	ngs	7.875

### Aluminum

gregated 8.0
lids 14, 17, 18, 24S
5.0
basis 3.0
oys 51, 52, 61, 63S
basis 5.7

## 

Oustrete scrup	
Pure cable	8.00
Old sheet and utensils	6.00
Old castings and forgings	5.00
Pistons, free of struts	5.00
Pistons, with struts	3.00
Old alloy sheet	5.00

### Magnesium\*

Segregated	plant scrap		
	and all other	solids.	exempt
Borings and	turnings		. 1.50

### Mixed, contaminated plant scrap

437	
*Nominal	

### Zinc

New zinc clippings, trimmings			6
Engravers, lithographers plates			6
Old zine scrap			
Unsweated zinc dross			5
Die cast slab			4
New die cast scrap	0 1	0 0	
Radiator grilles, old and new .			
Old die cast scrap			3

### Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead including cable, for f.o.b. point of shipment price.

### Nickel

NI content 98+%, Cu under 1/2%, 26c. per lb.; 90 to 98% Ni, 26c. per lb contained Ni.

### ELECTROPLATING ANODES AND CHEMICALS

4.75

Anodes	
(Cents per lb., f.o.b. shipping point	nt)
Copper: Cast, elliptical, 15 in. and	
longer	25 1/8
Electrolytic, full size	22 %
Rolled, oval, straight, 15 in. and	30 1/4
Curved	231/4
Brass Cast, 82-20, elliptical, 15	22.76
in. and longer	23 %
Zinc: Cast, 99.99, 16 in. and over.	16 14
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy	40
(1-9) oz., per oz	58

Chemicals
(Cents per lb., delivery from New York)
Copper cyanide, tech., 100-lb. bbls. 1-5 5,65
Copper sulphate, 99.5 crystals, bbls
Nickel salts, single, 425-lb. bbls
Silver cyanide, 100 oz. lots40.82-41.126
Sodium cyanide, 96% dom., 100-lb. dms. 0.15
Zinc, cyanide, 100-lb. dms 33.00
Zinc, sulphate, 89% crystals, bbls. 680

### WPB Acts to Increase Scrap Supply

Washington

• • • Attributing the situation partially to what they said was due to misleading press reports of plentiful supplies, WPB officials told the Iron and Steel Scrap Industry Advisory Committee at a recent meeting that stocks of heavy melting scrap have dropped to a dangerously low point. Inventories were said to be down to 1942 levels at which time shortages caused the shutdown of open hearth furnaces. Steel mill scrap requirements of purchased scrap were estimated at approximately 2 million tons monthly and it was stated that a deficit of 250,000 tons between requirements and the present monthly supply must be made up immediately.

A new program was outlined by the advisory committee in conjunction with WPB Steel Division officials providing that WPB emphasize to scrap dealers that they are included in Urgency Rating Bands III or IV in order that the responsible manpower priority committees may take the proper steps to insure labor referrals to plants where manpower is required; WPB's Salvage and Conservation Division to inform scrap dealers that they are entitled to aid in securing additional gasoline to move scrap to their yards and use of prisoners of war if they can be employed in sufficient number at one location.

Additional farm, railroad and automobile graveyard scrap is to be generated and industry to institute a better check on government surplus property inventories of scrap for report to WPB.

PITTSBURGH—There is a firming up of the turnings market here, but as yet prices have not advanced. Actually, there may be an advance before the week is out, but it hasn't occurred yet. There was one out-of-district short shoveling turning purchase shipped to this area at ceiling, but substantially larger purchases were made here at the going quoted prices. An easing of the car situation is bringing out a bit more industrial scrap and the railroad lists are getting heavier. War news has not yet caused any reaction in the market.

CHICAGO—A mill purchase here last week placed the price of No. 2 solid dealers' bundles without turnings at ceiling, although a previous purchase of this grade by another mill was cancelled. However, the same mill which cancelled its solid bundles and which had previ-

ously cancelled a bundled turning order at \$18.50 placed new orders for bundled turnings at the prevailing price of \$16.75. All primary open hearth grades were traded at ceiling. Further strengthening of the local market was indicated by brokers' buying prices for blast furnace grades for out-of-district shipment, which were well above prices last paid by local consumers. Mill inventories continue comfortable.

### New Scrap Drive?

Chicago

• • Newspapers here this week quoted John Nuveen, Jr., WPB regional director as stating that "WPB is on the verge of launching another scrap drive." Mr. Nuveen declined to officially confirm the report.

DETROIT—Scrap prices continued unchanged here this week, with the rather dull turnings quotations in neutral gear awaiting the opening of automotive lists late in the week. Brokers are surprised at the continued and solid demand for open hearth and electric furnace grades in the face of the favorable war situation in Europe.

CLEVELAND — While there are no price changes here, indications are that the turnings market is stronger. Turnings now are not being shipped out of town as extensively as they have been in recent weeks as mills here are apparently consuming most of the turnings produced locally.

ST. LOUIS—Improvement in weather conditions has caused a better movement of scrap iron to the St. Louis industrial district. Heavy melting steel is still scarce, however, although the mills are just about holding their own as to inventories. Turnings are in greater supply with prices unchanged.

PHILADELPHIA - Shipments are showing definite improvement now that spring has brought a longer work day and improved weather. Turnings tinue strong here, and there are no indications to hint at any weakness for the present. Mills, brokers and dealers here feel that if the new scrap drive which the WPB is getting set to launch is successful in getting out industrial scrap, yards will have to be supplied with additional manpower to handle the material brought out. It is understood that some scrap yards have been given higher manpower ratings and have been able to rehire some of their old labor.

NEW YORK—Movement of scrap continues to improve in this district but labor shortages continue. According to

dealers mill supplies remain tight but mills are ordering fewer cars than recently and no longer requesting delivery of big carloads. It is reported that turnings shipments are being held up by some mills and this may reflect some contamination of shipments. However, all grades continue to sell at ceilings.

BUFFALO - Heavy mill production schedules have taken more of the slack out of turnings as consumers, making the best of a lopsided market condition, are using this light industrial scrap to the greatest possible extent in blast furnaces and open hearths. Both melters and dealers, however, seem reluctant to make large commitments for this type of scrap at current levels, and business recently has consisted of a succession of orders for lots of 1000 tons or less. With mill receipts so heavily on the turnings side, a close check is kept on alloy content, with a consequent increase in rejections. Heavy melting steel remains tight as ever with manpower still the chief factor. Prospects for an early opening of navigation on the lakes are anticipated by consumers as a source of relief. Railroad scrap is reported moving on allocation to one of the big mills.

BOSTON—Business is largely confined to heavy steel, cast, borings and turnings, but there is not a great deal doing. With the exception of cast, the bulk of material moved goes to eastern Pennsylvania. Gas purifiers take borings, however. The car supply situation is somewhat better, although some yards report difficulty in getting cars when needed and railroads are still backward in supplying weights. Lack of labor is the scrapman's big problem and indications are it will become more so.

BIRMINGHAM—Demand for all grades of material is currently strong in this market and prices remain firm. Some open hearth scrap is being shipped on allocations from southern points to northern mills.

# Dealers See Prospects Good for Scrap Trade

Pittsburgh

• • • Scrap interests here are beginning to express interest in what will happen to the market when Germany fails. While no one will chance buying or selling on what he believes will happen, there is concern over the possibility of a break in prices resulting from a victory in Europe plus better weather conditions that will aid in scrap movement in the steel consuming areas. Scrap movement has improved appreciably as a result of about two weeks of good weather.

No. 1 RR. No. Hand Hay Macl Short Mixe Cast Hvy. No. RR. RR. Rails Low RR.

No.

No. No. No. Ma Sho Cas Mix Lov No.

No No No Bu Tu Ma Mi Cl' Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4). Where ceiling prices are quoted they do not include brokerage fee or adjusted transportation charges. Asterisks indicate grades selling at ceilings.

0	1	T	r	C	R	11	D	G	1	4
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Per gross ton delivered to consum	
	\$20.00*
RR. hvy. melting	20.00*
No. 2 hvy. melting	20.00
RR. scrap rails	21.50*
Rails 3 ft. and under	23.50
No. 1 comp'd sheets	20.00*
Hand bdld. new shts	20.00*
Hvy. axle turn	19.50
Hvy. steel forge turn	19.50*
Mach. shop turn\$13.00 to	13.50
Short shov. turn 15.50 to	16.00
Mixed bor. and turn 13.00 to	13.50
Cast iron borings 14.50 to	15.00
Hvy. break, cast	16.50*
No. 1 cupola	20.00*
RR. knuck. and coup	24.50*
RR. coil springs	
Rail leaf springs	24.50
Rolled steel wheels	24.50*
Low phos. bil. crops	25.00*
mon harden ami araba	
RR. malleable	
Rit. Illalicable	M M. UU

### CHICAGO

### Per gross ton delivered to consumer:

		-
No. 1 hvy. melting		8.75*
No. 2 hvy. melting	1	8.75
No. 1 bundles	1	8.75*
No. 2 dealers' bndls		18.75*
Bundled mach, shop turn.	16.25 to 1	6.75
Galv. bundles	14.25 to 1	4.75
Mach. shop turn		9.00
Short shovel, turn	9.25 to	9.75
Cast iron borings		9.75
Mix. borings & turn	9.25 to	9.75
Low phos. hvy. forge		3.75
Low phos. plates	!	21.25*
No. 1 RR. hvy. melt		19.75
Reroll rails		22.25*
Miscellaneous rails		20.25*
Rails 3 ft. and under		22.25
Locomotive tires, cut	!	24.25*
Cut bolsters & side frames		22.25
Angles & splice bars		22.25*
Standard stl. car axles		35.75*
No. 3 steel wheels		3.25
Couplers & knuckles	1	23.25*
Agricul, malleable		22.00
RR. malleable		22.00*
No. 1 mach. cast		*00.00
No. 1 agricul. cast		20.00
Hvy. breakable cast		16.50*
RR. grate bars		15.25*
Cast iron brake shoes		15.25
Stove plate		19.00*
Clean auto cast		20.00*
Cast iron carwheels		20.00*
	3000	

### CINCINNATI

		-			
Per	gross.	ton	delivered	to	consum

	\$19.50*
No. 2 hvy. melting	19.50*
No. 1 bundles	19.50*
No. 2 bundles	
Mach. shop turn \$8.00 to	8.50
Shoveling turn 9.00 to	9.50
Cast iron borings 8.50 to	9.00
Mixed bor. & turn 8.00 to	8.50
Low phos. plate	22.00*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Stove plate	
Scrap rails	21.50

### BOSTON

### Dealers' buying prices per gross ton,

No. 1 hvy. melting	\$15.05*
No. 2 hvy. melting	15.05°
No. 1 and 2 bundles	15.05*
Busheling	15.05*
Turnings, shovelings\$11.00 to	11.06
Machine shop turn 9.00 to	9.06
Mixed bor. & turn 9.00 to	9.06
Cl'n cast, chem. bor 13.06 to	14.15*
Truck delivery to foundry	
Machinery cast 21.00 to	23.51*
Breakable cast 21.57 to	21.87*
Stove plate 20.00 to	23.51*

### DETROIT

Per gross ton, brokers' b	uying	prices:
No. 1 hvy. melting		\$17.32*
No. 2 hvy. melting		17.32*
No. 1 bundles		17.32*
New busheling		17.32*
Flashings		17.32*
Mach. shop turn		to 9.50
Short shov. turn	10.50	
Cast iron borings	9.75	to 10.25
Mixed bor. & turn	9.00	to 9.50
Low phos. plate		
No. 1 cupola cast		
Charging box cast		
Hvy. breakable cast		
Stove plate		
Automotive cast		20.00*

### PHILADELPHIA

### Per gross ton delivered to consumer:

No. 1 hvy. melting	5	0		0					0		\$18.75
No. 2 hvy. melting	g				0.	0			0		18.75
No. 2 bundles											18.75
Mach. shop turn.											13.75
Shoveling turn											15.75
Cast iron borings											14.75
Mixed bor. & turn											13.75
No. 1 cupola cast											20.00
Hvy. breakable ca	ist										16.50
Cast, charging bo											19.00
Hvy. axle, forge											18.25
Low phos. plate .					•						21.25
Low phos. punchi		-			0						21.25
Dillet owens	ug	5			*					-	
Billet crops			ė				*	*	×	*	21.25
RR. steel wheels .			.00		0	0.					23.25
RR. coil springs .					0						23.25
RR. malleable											22.00

### ST. LOUIS

### Per gross ton delivered to consumer:

and the same and the same and the same	Page of the Co
Heavy melting	\$17.50° 17.50°
Bundled sheets	
Mach. shop turn \$7.00 t	
Hvy. axle turn 15.50 t	0 16.00
Locomotive tires, uncut	20.00
Misc. std. sec. rails	19.00*
Rerolling rails	21.00*
Steel angle bars	21.00*
Rails 3 ft. and under	21.50*
RR. springs	22.00*
Steel car axles	23.50*
Stove plate	19.00*
Grate bars	15.25*
Brake shoes	15.25*
RR. malleable	22.00*
Cast iron carwheels	18.50
No. 1 mach'ery cast	20.00*
Breakable cast	16.50

### BIRMINGHAM

### Per gross ton delivered to consumer:

No. 1 hvy. melting	\$17.00*
No. 2 hvy. melting	17.00*
No. 2 bundles	17.00*
No. 1 busheling	17.00*
Long turnings \$9.50 to	10.00
Cast iron borings 9.50 to	10.00
Bar crops and plate	19.50*
Structural and plate	19.50*
No. 1 cast	20.00*
Stove plate	17.00
Steel axles	18.00*
Scrap rails	18.50
Rerolling rails	20.50
Angles & splice bars	20.50*
Rails 3 ft. & under	21.00
Cast iron carwheels 16.50 to	17.00

### YOUNGSTOWN

### Per gross ton delivered to consumer:

No. 1 hvy. melting	\$20.00
No. 2 hvy. melting	20.00*
Low phos. plate	22.504
No. 1 busheling	20.00
Hydraulic bundles	20.00*
Mach. shop turn \$13.00 to	13.50
Short shovel, turn 15.00 to	15.50
Cast iron borings 14.00 to	14.50

### NEW YORK

negrera pulling brices her gross	ton,
on cars	
No. 1 hvy. melting	\$15.33*
No. 2 hvy. melting	15.33*
Comp. black bundles	15.33*
Comp. galv. bundles	13.33*
Mach. shop turn	10.33*
Mixed bor. & turn	10.33*
No. 1 cupola cast	20.00
Hvy. breakable cast	16.50
Charging box cast	19.00*
Stove plate	19.00*
Clean auto cast	20.000
Unstrip. motor blks	17.50
Cl'n chem. cast bor	14.33*

### BUFFALO

### Per gross ton delivered to consumer:

No. 1 hvy. melting	\$19.25
No. 1 bundles	19.25
No. 2 bundles	19.25
No. 2 hvy. melting	19.25
	13.00
	15.00
Shoveling turn	
Cast iron borings	14.00
Mixed bor. & turn	13.00
No. 1 cupola cast	20.00
Stove plate	19.00
Low phos. plate	21.75
Scrap rails	20.75
Rails 3 ft. & under	22.75
WA WA	23.75
Cast iron car wheels	20.00
RR. coll & leaf spgs	23.75
RR. knuckles & coup	23.75
RR. malleable	22.00
No. 1 busheling	19.25

### CLEVELAND

### Per gross ton delivered to consumer:

No. 1 hvy. melting	\$19.50°
No. 2 hvy. melting	19.50
Compressed sheet stl	19.50
Drop forge flashings	19.00
No. 2 bundles	19.50
Mach. shop turn \$12.50 to	
Short shovel 14.50 to	~ ~ ~ ~
	19.50
No. 1 busheling	
Steel axle turn	19.00
Low phos. billet and	
bloom crops	24.504
Cast iron borings 13.50 to	14.00
Mixed bor. & turn 12.50 to	13.00
No. 2 busheling	17.00°
No. 1 machine cast	20.00
Railroad cast	20.00
Railroad grate bars	15.25
Stove plate	19.00
	20.50
RR. hvy. melting	
Rails 3 ft. & under	23.00
Rails 18 in. & under	24.25
Rails for rerolling	23.00
Railroad malleable	22.00
Elec, furnace punch	22.00

### SAN FRANCISCO

### Per gross ton delivered to consumer:

RR. hvy. melting	15.50 to	\$16.25
No. 1 hvy. melting	15.50 to	16.25
No. 2 hvy. melting	14.50 to	15.25
No. 2 bales		
No. 3 bales		
Mach. shop turn		7.00
Elec. furn. 1 ft., und	15.50 to	17.00
No. 1 cupola cast	19.00 to	21.00

### LOS ANGELES

### Per gross ton delivered to consumer:

No.	1	hvy.	melting		0	\$14.50	to	\$15.50
No.	2	hvy.	melting			13.50	to	14.50
			*****					
			turn					
No.	1	CHEO	la cast.			19.00	to	21.00

### SEATTLE

### Per gross ton delivered to consumer:

RR, hvy. melting	\$13.50
No. 1 hvy. melting	13.50
No. 3 bundles	11.50
Elec. furn. 1 ft., und \$16,00 to	17.00
No. 1 cupola cast	

## Comparison of Prices . .

Advances Over Past Week in Heavy Type; Declines in Italics. Prices are F.O.P. Major Basing Points. The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 122-130.

				-
Flat Rolled Steel: Mar. 27,	Mar. 20,	Feb. 20,		Pig Iron: Mar. 27, Mar. 20, Feb. 20, Mar. 28,
(Cents Per Lb.) . 1945	1945	1945	1944	(Per Gross Ton) 1945 1945 1945 1944
Hot rolled sheets 2.20	2.20	2.10	2.10	No. 2 fdy., Philadelphia. \$26.84 \$26.84 \$25.84
Cold rolled sheets 3.05	3.05	3.05	3.05	No. 2, Valley furnace 25.00 25.00 25.00 24.00
Galvanized sheets (24 ga.) 3.65	3.65	3.50	3.50	No. 2, Southern Cin'ti 26.11 26.11 26.11 23.94
	2.10	2.10	2.10	
and a decided and a second	2.80	2.80	2.80	
Cold rolled strip 2.80				No. 2, foundry, Chicago†. 25.00 25.00 25.00 24.00
Plates 2.20	2.20	2.10	2.10	Basic, del'd eastern Pa 26.34 26.34 26.34 25.34
Plates, wrought iron 3.80	3.80	3.80	3.80	Basic, Valley furnace 24.50 24.50 24.50 23.50
Stain's c.r. strip (No. 302) 28.00	28.00	28.00	28.00	Malleable, Chicago; 25.00 25.00 25.00 24.00
				Malleable, Valley 25.00 25.00 25.00 24.00
Tin and Terne Plate:				L. S. charcoal, Chicago. 37.34 37.34 37.34 37.34
(Dollars Per Base Box)				Ferromanganese‡135.00 135.00 135.00 135.00
Tin plate, standard cokes \$5.00	\$5.00	\$5.00	\$5.00	Terromanganeset100.00 100.00 100.00
	4.50	4.50	4.50	+ The emitching shares for delicent to foundation to the Chi
was branch control of	4.30	4.30	4.30	† The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
Special coated mfg. ternes 4.30	4.00	4.00	2.00	f For carlots at seaboard.
				Last pig iron price change authorized by OPA effective
Bars and Shapes:				Feb. 14, 1945.
(Cents Per Lb.)				
Merchant bars 2.15	2.15	2.15	2.15	Scrap:
Cold finished bars 2.65	2.65	2.65	2.65	(Per Gross Ton)
Alloy bars 2.70	2.70	2.70	2.70	
Structural shapes 2.10	2.10	2.10	2.10	
Stainless bars (No. 302). 24.00	24.00	24.00	24.00	Heavy melt'g steel, Phila. 18.75 18.75 18.75 18.75
	4.40	4.40	4.40	Heavy melt'g steel, Ch'go 18.75 18.75 18.75 18.75
Wrought iron bars 4.40	4.40	4.40	4.40	No. 1 hy. comp. sheet, Det. 17.32 17.32 17.32 17.85
W' 1 W' D 1				Low phos. plate, Youngs'n 22.50 22.50 22.50
Wire and Wire Products:				No. 1 cast, Pittsburgh 20.00 20.00 20.00 20.00
(Cents Per Lb.)	~ ~ ~	2 22	2 22	No. 1 cast, Philadelphia. 20.00 20.00 20.00 20.00
Plain wire 2.60	2.60	2.60	2.60	No. 1 cast, Chicago 20.00 20.00 20.00 20.00
Wire nails 2.80	2.80	2.55	2.55	110. 1 cast, Officago 20.00 20.00 20.00 20.00
Rails:				Coke, Connellsville:
(Dollars Per Gross Ton)	0.40.00	010.00	040.00	(Per Net Ton at Oven)
Heavy rails\$43.00		\$40.00	\$40.00	Furnace coke, prompt \$7.00 \$7.00 \$7.00
Light rails 43.00	43.00	40.00	40.00	Foundry coke, prompt 8.25 8.25 8.25
Semi-Finished Steel:				Non-Ferrous Metals:
(Dollars Per Gross Ton)				
Rerolling billets\$34.00	\$34.00	\$34.00	\$34.00	(Cents Per Lb. to Large Buyers)
Sheet bars 34.00	34.00	34.00	34.00	Copper, electro., Conn 12.00 12.00 12.00 12.00
Slabs, rerolling 34.00	34.00	34.00	34.00	Copper, Lake 12.00 12.00 12.00 12.00
Forging billets 40.00	40.00	40.00	40.00	Tin (Straits), New York. 52.00 52.00 52.00 52.00
			54.00	Zinc, East St. Louis 8.25 8.25 8.25 8.25
Alloy blooms, billets, slabs 54.00	54.00	54.00	04.00	
Wiss Dada and Clades				Lead, St. Louis 6.35 6.35 6.35
Wire Rods and Skelp:				Aluminum, Virgin, del'd. 15.00 15.00 15.00 15.00
(Cents Per Lb.)			0.00	Nickel, electrolytic 35.00 35.00 35.00 35.00
Wire rods 2.00	2.00	2.00	2.00	Magnesium, ingot 20.50 20.50 20.50 20.50
Skelp 1.90	1.90	1.90	1.90	Antimony, Laredo, Tex 14.50 14.50 14.50 14.50
Latest steel interim price increase		ed by O	PA effecti	ve Jan. 11, 1945.

Latest steel interim price increase authorized by OPA effective Jan. 11, 1945.

# Composite Prices . .

FINISHED STEEL

March 27, 1945......2.25839c. a Lb.....

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

.....\$24.61 a Gross Ton..... \$19.17 a Gross Ton.....

		9c. a Lb		Gross Ton		Gross Ton
		9c. a Lb 5c. a Lb		Gross Ton		Gross Ton
One year a  1945 1944 1943 1942 1941 1940 1939 1938 1937 1936 1935	HIGH 2.25839c., Jan. 16 2.30837c., Sept. 5 2.25513c. 2.26190c. 2.43078c. 2.30467c., Jan. 2 2.35367c., Jan. 3 2.58414c., Jan. 4 2.58414c., Mar. 9 2.32263c., Dec. 28	LOW 2.21189c., Jan. 2 2.21189c., Oct. 5 2.25513c. 2.26190c.	HIGH	LOW \$23.61, Jan. 2 \$23.61 • 23.61	**************************************	LOW \$19.17 \$15.67, Oct. 24 19.17 19.17 \$19.17, Apr. 10 16.04, Apr. 9 14.08, May 16 11.00, June 7 12.67, June 8 12.67, June 9
1934 1933 1932 1931 1930	2,15367c., Apr. 24 1.95578c., Oct. 3 1.89196c., July 5 1.99626c., Jan. 13 2.25488c., Jan. 7 2.31773c., May 28	1.95757c., Jan. 2 1.75836c., May 2 1.83901c. Mar. 1 1.86586c., Dec. 29 1.97319c., Dec. 9 2.26498c., Oct. 29	17.90, May 1 16.90, Dec. 5 14.81, Jan. 5 15.90, Jan. 6 18.21, Jan. 7 18.71, May 14	16.90, Jan. 27 13.56, Jan. 3 13.56, Dec. 6 14.79, Dec. 15	13.00, Mar. 13 12.25, Aug. 8 8.50, Jan. 12 11.33, Jan. 6 15.00, Feb. 18 17.58, Jan. 29	9.50, Sept. 25 6.75, Jan. 3 6.43, July 5 8.50, Dec. 29

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

PIG IRON

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

SCRAP STEEL

"Quick, uniform servicebenefits formed, user.

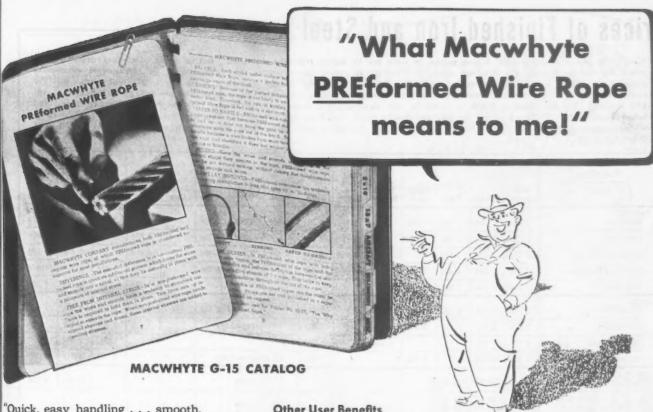
PREF

All wire PRE for spiral, s place. B stress, a has great friction moving reduced internal

In M strand it tension. out of "loaf." makes ception

M

M. In



Quick, easy handling . . . smooth, uniform spooling ... long, economical service - those are some of the plus benefits I get from Macwhyte PREformed," says the typical wire rope

### Why Macwhyte PREformed is preferred

All wires and strands in a Macwhyte PREformed rope are formed into a spiral, so that they lie naturally in place. Because it is free from internal stress, a Macwhyte PREformed rope has great fatigue resistance. Internal friction caused by wires and strands moving against each other is sharply reduced, resulting in a minimum of internal wear.

In Macwhyte PREformed, every strand in the rope is under uniform tension. There is no "early" wearing out of some strands while others loaf." The perfect balance of strands makes Macwhyte PREformed exceptionally kink resistant.

### Other User Benefits

Macwhyte PREformed on your equipment means fewer shut-downs, less trouble. It is safer to use because it can be cut without seizing-broken strands won't wicker. The extreme flexibility of Macwhyte PREformed makes it hug the drum, reduces wear both on the wires and in the groove of the sheave. Because of its long life, Macwhyte PREformed gives lowest possible cost per load carried.



All this, and Macwhyte Internal Lubrication, too!

Every wire in every strand of Macwhyte PREformed rope is coated with Macwhyte internal lubricant to protect against moisture, rust and ordinary acids. Heavy and tenacious, it clings to the wires unaffected by temperature changes.

The demands of our armed services are so great now, there may be times when we cannot give you our usual prompt service and delivery. The situation changes from day to day, so please keep trying. We'll serve you if we possibly can.



The correct rope for your equipment

### MACWHYTE COMPANY Manufacturers Wire Rope

2911 FOURTEENTH AVENUE

KENOSHA, WISCONSIN

Mill Depots: New York . Pittsburgh . Chicago . Fort Worth . Portland . Seattle . San Francisco. Distributors throughout the U.S.A. MACWHYTE Braided Wire Rope Slings MACWHYTE PREformed and MONARCH WHYTE STRAND Wire Rope

MACWHYTE Aircraft Cables and Tie-Rods MACWHYTE Special Traction Elevator Rope Internally Lubricated Wire Rope MACWHYTE Monel Metal Wire Rope MACWHYTE Stainless Steel Wire Rope

### Prices of Finished Iron and Steel.

Steel prices shown here are f.o.b. basing points, in cents per lb. unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per 100 lb. under base; primes, 25c. above base. (2) Unassorted commercial coating. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade, (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price for annealed, bright finish wires, commercial spring wire. (15) Deduct 10c. per 100 lb. for plates not produced to sheared mill or universal mill width and length tolerances.

Basing Point												10	DELI	VERED	то
Product	Pitts- burgh	Chicago	Gary	Cleve- land	Birm- ingham	Buffalo	Youngs- town	Spar- rows Point	Granite City	Middle- town, Ohio	Gulf Ports, Cars	Pacific Ports, Cars	Detroit	New York	Phila- delphia
SHEETS Hot rolled	2.20¢	2.20¢	2.20∉	2.20∉	2.20€	2.20∉	2.20∉	2.20∉	2.30€	2.20∉		2.75∉	2.30∉	2.44¢	2.37∉
Cold rolled 1	3.05€	3.05€	3.05é	3.05é		3.05é	3.05∉		3.15¢	3.05∉		3.70∉	3.15∉	3.39∉	3.37∉
Galvanized (24 gage)	3.65¢	3.65é	3.65€		3.65é	3.65é	3.65é	3.65€	3.75€	3.65¢		4.20€		3.89∉	3.82∉
Enameling (20 gage)	3.35€	3.35é	3.35€	3.35é			3.35€		3.45€	3.35é		4.00€	3.45€	3.71∉	3.67∉
Long ternes 2	3.80€	3.80€	3.80€	0.004			0.000					4.55€		4.16∉	4.12é
STRIP	0.00	0.00¢	0.60¢		_							11007			
Hot rolled 3	2.10∉	2.10∉	2.10∉	2.10¢	2.10∉		2.10∉			2.10∉		2.75€	2.20∉	2.46¢	
Cold rolled 4	2.80∉	2.90∉		2.80∉			2.80∉	(Wo	rcester=3	1.00¢)			2.90∉	3.16∉	
Cooperage stock	2.20¢	2.20€	March Sand	-	2.20∉		2.20∉							2.58∉	
Commodity C-R	2.95∉	3.05∉		2.95∉			2.95∉	(Wo	rcester=3	3.35¢)			3.05∉	3.31∉	
TIN PLATE											170.0	-			
Standard cokes, base box	\$5.00	\$5.00	\$5.00						\$5.10					5.36∉	5.32∉
Electro, box 0.50 lb. 0.75 lb.	\$4.35 \$4.50 \$4.65	\$4.35 \$4.50	\$4.35 \$4.50 \$4.65		11				\$4.60 \$4.75						
BLACK PLATE 29 gage <sup>5</sup>	3.05∉	3.05∉	3.05∉	100					3.15¢			4.05¢13			3.37¢
TERNES, MFG. Special coated, base box	\$4.30	\$4.30	\$4.30						\$4.40						
BARS Carbon steel	2.15∉	2.15∉	2.15∉	2.15∉	2.15∉	2.15∉		(1	Ouluth=2	.25¢)	2.50∉	2.80∉	2.25∉	2.49¢	2.47¢
Rail steel®	2.15∉	2.15∉	2.15∉	2.15¢	2.15¢	2.15∉					2.50∉	2.80∉			
Reinforcing (billet) 7	2.15¢	2.15¢	2.15∉	2.15∉	2.15€	2.15¢	2.15∉	2.15			2.50∉	2.55€1	2.25∉	2.39∉	
Reinforcing (rail) 7	2.15∉	2.15∉	2.15∉	2.15∉	2.15∉	2.15∉	2.15∉				2.50¢	2.5541	2.25∉		2.47€
Cold finished 8	2.65∉	2.65€	2.65∉	2.65∉		2.65€			(Detroit	=2.70¢)	(Tole	do=2.80	()	2.99∉	2.97
Alloy, bot rolled	2.70€	2.70∉				2.70		(Bethle	hem, Mass	illon, Can	ton = 2.70	9	2.80∉		
Alloy, cold drawn	3.356	3.35é	3.35é	3.356		3.354		-					3.45∉		
PLATES Carbon steel 18	2.20	2.20∉	2.20¢	2.20	2.20		2.20¢	2.20	(Coates	rille and Ci	aymont-	2.20¢) 2.75¢	2.42¢	2.39¢	2.25
Floor plates	3.356	3.35€						-			3.70	4.00		3.716	3.67
Alloy	3.506	3.50é	-	-	(Ce	atesville=	3.50é)				3.95	4.15		3.70	3.59
SHAPES Structural	2.10		2.10€		2.10			(Bethleh	em = 2.10	e)	2.45	3.75		2.27	2.218
SPRING STEEL, C-R 0.26 to 0.50 Carbon	2.80			2.80	4		(W	orcester	=3.00¢)						
0.51 to 0.75 Carbon	4.30	6		4.30	É		(W	orcester	=4.50¢)						
0.76 to 1.00 Carbon	6.15	4		6.15	é		(W	oreester	=6.35¢)						
1.01 to 1.25 Carbon	8.35	é		8.35	é		(W)	orcester	=8.55€)						
WIRE 9 Bright 14	2.60	é 2.60é		2.60		é	(W	orcester=	-2.70¢)	(Duluth	=2.65∉)	3.10	é		2.92
Galvanised			-1	-	Add	proper sin	e extra an	d galvan	zing extra	to Bright	Wire base	)	-1		T'
Spring (High Carbon)	3.20	é 3.20é		3.20				orcester				3.70	4		3.52
PILING Steel Sheet	2.40			5.50		2.40						2.95	4		2.72

EXCEPTIONS TO PRICE SCHED. NO. 6.

Slabs, per gross ton—Andrews Steel Co. \$41 basing pts.; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger \$37.75 f.o.b. Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. \$41; Phoenix Iron Co. (rerolling) \$41, (forging) \$47; Granite City Steel \$47.50; Kaiser Co. (rerolling) \$58.64, (forging) \$64.64, f.o.b. Los Angeles.

Blooms, per gross ton—Phoenix Iron Co. (rerolling) \$41; (forging) \$47; Pgh. Steel Co. (rerolling) \$38.25, (forging) \$44.25; Wheeling

Steel Corp. (rerolling) 4 in. sq. or larger \$37.75 f.o.b. Portsmouth; Kaiser Co. (rerolling) \$58.64, (forging) \$64.64, (shell steel) \$74.64 f.o.b. Los Angeles.

Sheet Bar, per gross ton—Empire Sheet & Tin Plate Co. \$39 mill; Wheeling Steel Corp. \$38 Portsmouth, Ohio.

Billets, Forging, per gross ton—Andrews Steel Co. \$50 basing pts.; Follansbee Steel Corp. \$49.50 Toronto, Ohio; Phoenix Iron Co. \$47 mill; Geneva Steel Co. \$64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. \$49.50; Kaiser

Co. \$64.64, (shell steel) \$74.64, f.o.b. Los Angeles.

Billets, Rerolling, per gross ton—Continental Steel Corp. may charge Acme Steel in Chicago switching area \$34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) \$41 mill; Wheeling Steel Corp. 4 in. sq. or larger \$37.75, smaller \$39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at \$39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. \$41 mill; Continen-

tal Steel C \$40.60 Koko size extra) 336.40 Peor mingham; Mich.; Gen Coast; Pgl \$58.64 f.o.b

Structural basing pt Knoxville Kaiser Co.

Rails, per steel) \$50 s weight) o W. Va.; Pueblo.

Het Rolle 2.65c. mill pts.; Kaise Pacific Pc 2.50c. basi 2.35c. Gran

Merchant over, 2.85c basing pts Co. 2.40c. steel) 2.33 2.35c. Ch Warner C Knoxville lede Steel Chicago Mfg. Co.,

Pipe Skel 2.05c.

Reinforcia and over, steel), 2.3 Pacific Po

Cold Fin
Co. on a
c/l freigh
Spring C
Co. on al
falo c.f.
Mansfield
Finished
New En
freight
Fressed
Side Nev
freight
Readville
cago c.f.
Louis, f.c.

Alloy Ba cept Tex Fort Wor outside A Florida, mingham

Het Rell 2.30c. Ch ing pts.

Hot Roll town ba Parkersb burg.

Galvaniz basing 3.85c. P basing town ba Sheet S Lend-Le

when p Coast an Chester, Harrisb

Black S maximu with dif provided

Wire F Pittsbur in., 2.2 bright and fur nealed 3.90c.; 2.65c.; spring tal Steel Corp. (1% x 1%) \$39.50, (2 x 2) \$40.60 Kokomo, Ind. (these prices include \$1 size extra); Keystone Steel & Wire Co. 36.40 Peoria; Connors Steel Co. \$50.60 Birmingham; Ford Motor Co. \$34 Dearborn, Mich.; Geneva Steel Co. \$58.64 f.o.b. Pacific Coast; Pgh. Steel Co. \$43.50; Kaiser Co. \$58.64 f.o.b. Los Angeles.

Structural Shapes—Phoenix Iron Co. 2.35c. basing pts. (export) 2.50c. Phoenixville; Knoxville Iron Co. 2.30c. basing points; Kaiser Co. 3.20c. f.o.b. Los Angeles.

Rails, per gross ton—Sweet Steel Co. (rail steel) \$50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington. W. Va.; Colorado Fuel & Iron Corp., \$45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. 2.65c. mill; Knoxville Iron Co. 2.25c. basing pts.; Kaiser Co. and Geneva Steel Co. 3.20c. Pacific Ports; Central Iron and Steel Co. 2.50c. basing points; Granite City Steel Co. 2.35c. Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, 2.85c. mill; Eckels-Nye Steel Corp. 2.50c. basing pts. (rail steel) 2.40c.; Phoenix Iron Co. 2.40c. basing pts.; Sweet Steel Co. (rail steel) 2.33c. mill; Joslyn Mfg. & Supply Co., 2.35c. Chicago; Calumet. Steel Div., Borg Warner Corp. (8 in. mill bar), 2.35c. Chicago; Knoxville Iron Co., 2.30c. basing pts.; Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill.; Milton Mfg. Co., 2.75c. f.o.b. Milton, Pa.

Pipe Skelp-Wheeling Steel Corp., Benwood, 2.05c.

Reinforcing Bars—W. Ames & Co., 10 tons and over, 2.85c. mill; Sweet Steel Co. (rail steel), 2.33c, mill; Columbia Steel Co., 2.50c. Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New Engand Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Mansfield, Mass., f.o.b. Mansfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants, f.o.b. plant; Compressed Steel Shafting Co. on allocation cutside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass. f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co., for delivery except Texas and Okla., Chicago base, f.o.b. Fort Worth, Tex.; Connors Steel Co., shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Het Rolled Strip—Joslyn Mfg. & Supply Co., 2.30c. Chicago; Knoxville Iron Co., 2.25c. lasing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., 2.25c. Parkersburg.

Galvanized Sheets—Andrews Steel Co. 3.75c. basing pts.; Parkersburg Iron & Steel Co., 3.75c. basing pts.; Continental Steel Co., Middle-town base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is 2.45c. per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

Wire Products—Pittsburgh Steel Co., f.o.b. Pittsburgh, per 100 lb., rods, No. 5 to 9/32 in., 2.20c.; rods, heavier than 9/32, 2.35c.; bright wire, 2.725c.; bright nails, 2.90c.; lead and furnace annealed wire, 2.85c.; pot annealed wire, 2.85c.; galvanized barbed wire, 2.90c.; plain staples, 2.55c.; galvanized staples, 2.65c.; bright spring wire, 3.30c.; galvanized spring wire, 3.45c

d-



How Biltwell Brushes

are Made

Wire is bent into proper shape

Goat hair is placed

between wires, then twisted

3. Now the twisting is complete

4. Brush is trimmed

to desired diameter

More than 3 million Biltwell Brushes are being made each year for just this one purpose . . . to clean the heads of electric shavers, like the Remington Rand shown in the illustration. The backbone of each of these brushes is Keystone Wire . . . another example of the versatility and adaptability of Keystone wire production.

At first thought, it may seem that almost any wire of the desired gauge would be suitable for this purpose. But the wire must be *pliable* to withstand twisting . . . *uniform* to decrease breakage . . . with proper *stiffness* to make a sturdy handle. Special Keystone Wire fully meets these requirements, as proven by the popularity of Biltwell Brushes.

Today, Keystone Wire is serving in thousands of fighting forms as parts of ships, planes, tanks, guns and ammunition—as well as essential civilian items.

\*Billwell Brush Company, Rockford, Illinois

### KEYSTONE STEEL & WIRE CO. Peoria 7, Illinois



### WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

		SHEETS	4-1-4	STE	RIP			BA	RS	nic 1	ALLOY	RARS	
Citios	Hot Rolled (10 gage)	Cold Relied	Gaivanized (24 gage)	Hot Rolled	Cold Rolled	Plates 1/4 in, and heavier	Structural Shapes	Hot Relied	Celd Finished	Het Rolled, NE 8617-20	Het Rolled, NE 9442-48 Ann,	Celd Drawn, NE 8617-20	Cold Drawn NE 9442-4 Ann.
Philadeiphia New York Beeton Battimore New York Beeton Battimore New York Botton Battimore New York Chleage Mitwaukee Cleveland Buffale Deirolt Cincinnati St. Louis Pittaburgh St. Paul Omaha Indiampolis Birmingham Mempris New Orleane Houston Los Angeles San Francisco Seattle	3.45 3.45 3.55 3.525 3.497 3.45 3.61 3.965	\$4,8726 4,6133 4,7449 4,852 4,295 4,40 4,473 4,40 4,473 4,40 4,473 4,40 4,473 4,40 4,473 5,443 3,58 5,573 7,203 7,205 6,605 6,605	\$5.168a 5.160 5.3749 5.044 5.521 5.381 6.4224 5.0274 4.904 5.154 4.9783 5.3224 4.90 5.4074 5.7584 4.718 4.90 3.415 5.508 6.4631 6.264 6.504 6.104 5.904	\$3,922 3,974° 4,106 3,902 4,185 3,60 3,775 3,60 3,775 3,777 3,60 4,215 4,215 4,318 4	\$4.772 4.772 4.772 4.715 4.752 4.865 4.6637 4.767 4.45 4.669 4.669 4.669 4.711 4.3317 4.45 4.3517 3.768	\$3,705 3,888 4,012 3,684 4,071 3,68 3,73 3,709 3,711 4,285 4,88 4,125 4,25 4,25 4,25 4,25 4,25 4,25 4,25 4,85 4,	\$3,686 3,758 3,912 3,759 4,002 3,85 3,85 3,881 3,681 3,681 3,681 3,681 3,681 3,681 3,681 4,165 3,63 3,53 4,165 4,165 4,25 4,25 4,351 4,451 4,451 4,451 4,451	\$3,822 3,853 4,044 3,805 3,50 3,637 3,25 3,46 3,76 4,118 3,50 4,015 4,108 4,181 4,4811 4,4811	\$4,072 4,103 4,144 4,052 4,165 3,75 3,75 3,75 3,75 3,75 4,031 4,031 4,031 4,43 4,33 4,43 4,43 4,43 4,52 6,373 5,583 5,583 5,783	\$5,968 6,008 6,162  5,75 5,987 5,958 8,75 8,08 6,131 5,75 6,09 8,08  7,223 8,304 8,304	\$7,066 7,108 7,262  6,85 7,087 7,086 6,85 7,18 7,231 6,85 7,19 7,18  8,323 9,404 9,404 9,404 9,404	\$7.272 7.303 7.344 6.85 7.087 6.85 7.159 7.231 8.85 7.561 7.18 8.323 9.404 9.404 8.394	\$8.322 8.353 8.394 7.90 8.137 7.90 7.90 8.209 8.281 7.90 8.711 8.22 9.372 10.454 10.454

### National Emergency Steels MILL EXTRAS

	Basic Ope	on-Hearth	Electric	Furnace		Basic Ope	en-Hearth	Electric	Furnace
Designa- tion	Bars and Bar-Strip	Billietz, Bioome, and Slabe	Bars and Bar-Strip	Billets, Bioome, and Slabe	Designa- tion	Bars and Bar-Strip	Billets, Bicome, and Slabe	Bars and Bar-Strip	Billeta, Blooms, and Slabe
NE 8612 NE 8615 NE 8617 NE 8620 NE 8622 NE 8627 NE 8627 NE 8632 NE 8633 NE 8635 NE 8635	0.65¢ 0.65 0.65 0.65 0.65 0.65 0.65 0.65	\$13.00 13.00 13.00 13.00 13.00 13.00 13.00 13.00 13.00 13.00	\$1.15 1.15 1.15 1.15 1.15 1.15 1.15 1.15	\$23.00 23.00 23.00 23.00 23.00 23.00 23.00 23.00 23.00 23.00 23.00	NE 9427 NE 9430 NE 9432 NE 9435 NE 9437 NE 9440 NE 9442 NE 9445 NE 9447 NE 9450	0.75¢ 0.75 0.75 0.75 0.75 0.80 0.80 0.80	\$18.00 15.00 15.00 15.00 15.00 16.00 16.00 16.00	\$1.25 1.25 1.25 1.25 1.25 1.25 1.30 1.30 1.30	\$25.00 25.00 25.00 25.00 25.00 26.00 28.00 28.00 28.00
NE 8640 NE 8642 NE 8645 NE 8647 NE 8650	0.65 0.65 0.65 0.65 0.65	13.00 13.00 13.00 13.00 13.00	1.15 1.15 1.15 1.15 1.15	23.00 23.00 23.00 23.00 23.00	NE 9722 NE 9727 NE 9732 NE 9737 NE 9742 NE 9745	0.65 0.65 0.66 0.65 0.65	13.00 13.00 13.00 13.00 13.00	1.15 1.16 1.15 1.15 1.15 1.15	23.00 23.00 23.00 23.00 23.00 23.00
NE 8712 NE 8715 NE 8717 NE 8720 NE 8722 NE 8725	0.70 0.70 0.70 0.70 0.70 0.70	14.00 14.00 14.00 14.00 14.00	1.20 1.20 1.20 1.20 1.20	24.00 24.00 24.00 24.00 24.00 24.00	NE 9747 NE 9750 NE 9763 NE 9768	0.65 0.65 0.65 0.65	13.00 13.00 13.00 13.00	1.15 1.15 1.15 1.15	23.00 23.00 23.00 23.00
NE 8727 NE 8730 NE 8732 NE 8735 NE 8737 NE 8740 NE 8742 NE 8745 NE 8747 NE 8747	0.70 0.70 0.70 0.70 0.70 0.70 0.70 0.70	14.00 14.00 14.00 14.00 14.00 14.00 14.00 14.00 14.00 14.00	1.20 1.20 1.20 1.20 1.20 1.20 1.20 1.20	24.00 24.00 24.00 24.00 24.00 24.00 24.00 24.00 24.00 24.00	NE 9830 NE 9832 NE 9935 NE 9837 NE 9842 NE 9845 NE 9847 NE 9850	1.30 1.30 1.30 1.30 1.30 1.30 1.30 1.30	26.00 26.00 26.00 26.00 26.00 26.00 26.00 26.00	1.80 1.80 1.80 1.80 1.80 1.80 1.80	38.00 36.00 36.00 36.00 36.00 36.00 36.00 36.00
NE 9415 NE 9417 NE 9420 NE 9422 NE 9425	0.76 0.75 0.75 0.75 0.76 0.75	15.00 15.00 16.00 16.00 15.00	1.25 1.25 1.25 1.25 1.26	25.00 25.00 25.00 25.00 25.00	NE 9912 NE 9915 NE 9917 NE 9920 NE 9922 NE 9925	1.20 1.20 1.20 1.20 1.20 1.20	24.00 24.00 24.00 24.00 24.00 24.00	1.55 1.55 1.55 1.55 1.55	31.00 31.00 31.00 31.00 31.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under, with a maximum individual piece weight of 7000 lb. irrespective of size. Note 2: For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, AISI Steel Products Manual. Note 3: When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and \$5 per gross ton for billets, blooms and slabs. Note 4: The extras shown are in addition to the base price of \$2.70 for 100 lb. on finished products and \$54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two

### BASE QUANTITIES

Standard unless otherwise keyed on

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 199 lb. (7) 400 to 1499 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1000 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over. (4) Philadelphia; Galvanized sheet, 25 or more bundles.

ore bundles.

Extra for size, quality, etc., apply on above

quotations. \*Add 0.271c. for sizes not rolled in Birming-

\*\*\*City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

### LAKE SUPERIOR ORES

(51.50% Fe, Natural Content, Delivered Lower Lake Ports\*)

Per Gross Ton 

### **FLUORSPAR**

Maximum price f.o.b. consumer's plant, \$30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is

### Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

		CaF <sub>2</sub>								8	7	10	or	t ton
		more												
60%	but	less	than	650%	0	. ,	÷		•				٠	31.00
		n 60												

Ingots, Base per
Except
charge \$
Pacific C
plate Co. Ingots,

Base per ham, land, ( town
Except
charge \$
Co., \$39. Co., \$39. Coast p Ingots, Base per hem,

ville, burgh Except \$2.00; \$3.00. \$3.00. ( \$45.00 f. Billets, Pittsby Youngsto

rows Polivered ered E. Duluth, f.o.b. Pa 11.20 I Rerolling For e For e see the steel pr

Alloy E Pittsbur sillon, per gr Price East

Shell S

3 in. to 12 in. t 18 in. a Basic Basic Pittsbur land, Y Prices higher; Price permitte f.o.b. T \$52.00. Note: lots of

which a requirer Sheet Pittsl town, I Open h

Coatesy Groove Wire I

Skelp Pitts

Pittsbu Worces San Fr 9/32 er. Qu

(F.o.b. High Straigh Tungst High-c

Oil ha Special Extra Regula War are 2c 3c. hig

### SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling
Base per gross ton, Lob. mill.... \$31.00
Exceptions: Phoenix Iron Co. may
charge \$38.75; Kaiser Co., \$43.00 Lob.
Pacific Coast ports: Empire Sheet & Tinplate Co., \$34.26; Pgh. Steel Co., \$33.10.

Ingots, Carbon, Forging
Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngs-

Ingots, Alloy ase per gross ton, f.o.b. Bethle-hem, Buffalo, Canton, Coates-ville, Chicago, Massillon, Pittsville, burgh

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are \$2.00 higher; delivered E. Michigan, \$3 higher; f.o.b. Duluth, billets only, \$2.00 higher; billets f.o.b. Pacific ports are \$12 higher. Provo, \$11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

Per Gross Ton

Rerolling \$34.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices. Billets, Blooms and Slabs

steel prices.

### Shell Steel

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

d

Pittsburgh, Chicago, Cleveland, Youngs-town, Buffalo, Canton, Sparrows Point. Per Gross Ton Open hearth or bessemer . . . . . . \$34.00

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

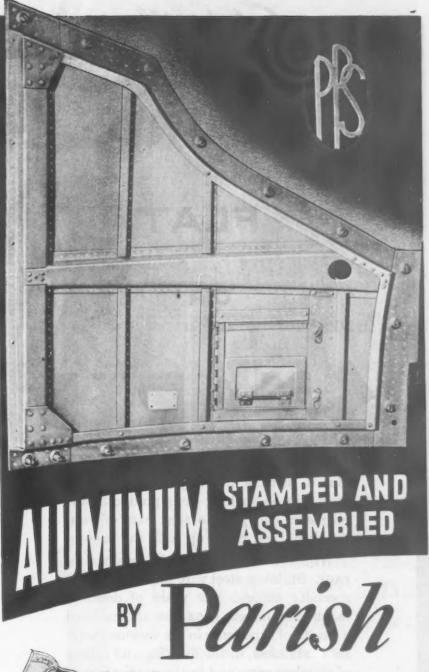
Per Lb. Grooved, universal and sheared .. 1.90c.

Wire Rods

(No. 5 to 9/32 (n.) 

### TOOL STEEL

100	pr -0	I be	lan in				
(F.o.b. Pittsburgh,	Bet	hle	he	m,	Sy	racuse	)
III.					Bas	e per ll	
High speed						. 67	
sugient molypdent	1177					D 44	Č,
Tungsten-molyhden	11111					5736	C.
righ-carbon-chrom	um					. 430	C.
Oil hardening						. 24	Ċ.
special carpon						. 220	e.
Extra carbon						. 18	C.
Regular carbon						. 14	B.
Warehouse price are 2c. a lb. highe 3c. higher.	18 e	ast	. (	310	Mil	381881 <b>D</b> ]	pl



Rigid adherence to specifications, speed of production and low cost feature Parish Aluminum Stampings. From preliminary design to finished assembly, every detail is handled in the Parish plant. Discuss your parts and assembly requirements with Parish engineers to determine how metal stampings may help you achieve greater production at lower costs.

# Modern Design at Low Cost

# Parish Pressed Steel Co.

Subsidiary of SPICER MFG. CORP., READING, PA. Western Representative: F. Somers Paterson, 57 California St., San Francisco, Calif.



 Every production problem is different. But if there is any way to use stainless steel wire in making your product, PAGE engineers can go into that part of your problem—and come up with the answer.

Wire has always been the business of PAGE. Stainless steel wire has been a PAGE specialty through the years of development of stainless. PAGE has accumulated a wealth of experience in the various analyses of stainless, in the drawing and rolling of stainless wire, and in the application of such wire to manufacture of other products.

The PAGE distributor nearest you offers you the benefit of this experience. If you have any production problem that might be solved by the use of stainless steel wire, it will pay you to

Get in touch with Page!



Monessen, Pa., Atlanta, Chicago, Denver, Los Angeles, New York, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

> PAGE STEEL AND WIRE DIVISION AMERICAN CHAIN & CABLE

### WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills To the to

(F.o.b. Pittsburgh only on wrought pipe)
Base Price—\$200.00 per Net Ton

### Steel (Butt Weld)

½ in	
1 to 3 in 68 ½	57 1/2
Wrought Iron (Butt Weld)	
½ in 24	3 1/4
¾ in 30	10
1 and 1% in 34	16
1 1/2 in	181/2
2 in 37 1/2	18
Steel (Lap Weld)	
	1 - 1

### Wrought Iron (Lap Weld)

		C			-			_	в-		-		-		
2	in.						×	*		1		*		301/2	12
2	1/2 to	34	& in.		*		*		*	*		*		31 1/2	14
4	in.			,		*	×		*	*		*		33 1/4	18
4	1/2 to	8	in.					z		*			*	321/2	17

### Steel (Butt, extra strong, plain ends) ½ in. ¾ in. 1 to 3 in.

### Wrought Iron (Same as Above)

Steel (La	p, e:	ĸi	IF	a	1	st	8	0	81	i g	,	plain	ends)
2 in												59	484
21/2 and 3	in.											63	524
31/2 to 6	in											66 1/2	56

### Wrought Iron (Same as Above)

		GP		-						-		-	-	-					,	
																	33			16
21/2	to	4	in.				0	0	0	0					0		39			22
4 1/2	to	6	in.				0		0				0	0		0	37	3/4		21
0	n	bu	tt 1	WE	1	d		8	LI	10	1	1	18	13	9		weld	8	eel	p
jobl	ber	8 8	re	gı	37	LI	1	te	ed	l	8	L	d	li	8	C	ount	of	5%	10
less	-th	an	-ca	rle	30	a	d		1	gl	h	lg	n	n	e	D	ts	pri	ces	8

less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card. F.o.b. Gary prices are two points lower discount or \$4 a ton higher than Pittaburgh or Lorain on lap weld and one point lower discount, or \$2 a ton higher on all butt weld.

CAST IRON WATER PIPE

					Per	n N	et	T
6-in.	and	larger.	del'd	Chie				
		larger.						
		larger,						
6-in.	and	larger	f.o.t	cal	rs, S	sar	1	
F3-		T					- 1	400

6-in. and larger 1.0.5. cars, San Francisco or Los Angeles ... 69.40 6-in. and larger f.o.b. cars, Seattle. 71.20 Class "A" and gas pipe, \$3 extra; 4-in. pipe is \$3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are \$45 at Birmingham and \$53.80 delivered Chicago, \$59.40 at San Francisco and Los Angeles, and \$70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

### **BOILER TUBES**

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall, Net base prices per 106 ft. f.o.b. Pitsburgh, in carload lots.

							E OH	Ch.	22 01		27.04
						L	rau	on R	olle	d R	olled
2	in.	o.d	. 13	B	.W.		15.0			4	12,38
2 1/2	in.	o.d	. 12	B.	W.	G.	20.2	11	17.5	4	16.58
3	in.	o.d	. 12	B.	W.	G.	22.4	8	19.5	0	18.36
3 1/2	in.	o.d	. 11	B	.W.	G.	28.3	7	24.6	2	23.15
4	in.	o.d	. 10	) B	.W.	G.	35.2	10	30.5	4	28.66
(	Ext	ras	fo	r le	888	ca	rloa	d q1	Hani	ittie	(8)
40,6	000	1b.	or	ft	ar	be	ove	r			Base
30,0	000	lb.	or	ft.	to	39	,999	lb.	or	It.	5%
20,0	000	lb.	or	ft.	to	29	,999	lb.	or	ft.	10%
	000	lb.	or	ft.	to	19	,999				20%
								lb.	or	ft.	30%
							,999	lb.	OF	ft.	45%
I'n	der	2.0	00	lb.	OF	ft.					65%

Seamless Hot

Black Galv. 51

Sandard Coated n Cut nails

Woven w Fence pos Single loc Galvanize Twisted

\*15½ pools in \*Prices portation BOLTS,

Bolts an F.o.b. 1 Machine

116 & 5

Nuts, Co

11/6 to 11/6 to 11/6 in. a On ab plow bo per cent There is ance for

Semi-Fin. 7/16 in. 1½ in. ar 1½ in. th 9/16 in. 1½ in. a In full discount discount.

Stove E Package in packa In bulk On st 35c. per cago, Ne

Large 1 cago. Small I

(7/16 F.o.b. P Birmi

Cap an Upset and in Upset so Milled so Flat hear Freigh based on lots

### WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth Pacific

		Points† per Keg
andard wire nails	\$2.80	\$3.30
Coated nails	2.80	3.30
cut nails, carloads	3.85	
		r 100 lb.
Annealed fence wire		\$3.55
Annealed galv. fence wire		
		Column
Woven wire fence		.35
Fence posts, carloads		
Single loop bale ties		
Galvanized barbed wire**	.70	.80
Twisted barbless wire	.70	

\*15½ gage and heavier. \*\*On 80-rod spools in carload quantities. †Prices subject to switching or transportation charges.

### BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

ici

(F.o.b. Pittsburgh, Cleveland, Birming-ham or Chicago)

Machine and Carriage Bolts:

Dust district tos case tots
Per Cent Off List
m. & smaller x 6 in. & shorter 651/2
3/16 & % in. x 6 in. & shorter 63 1/2
% to 1 in. x 6 in. shorter
1½ in. and larger, all lengths59
All diameters over 6 in. long59
Lag, all sizes
Plow bolts

Nuts.	Cold	Punched	or	Hot	Pressed:

(Hexagon or Square)
4 in. and smaller
9/16 to 1 in. inclusive 59
1% to 1½ in. inclusive
1% in. and larger
On above bolts and nuts, excepting
plow bolts, additional allowance of 10
per cent for full container quantities.
There is an additional 5 per cent allow-
ance for carload shipments.

Semi-Fin. Hexagon Nuts U.S.S.	
Base discount less keg lots	64
7/16 in. and smaller 62	
½ in. through 1 in	60
1½ in. through 1½ in 57 1% in. and larger 56	58
In full keg lots, 10 per cent add	litional

Stove Bolts	Consumer
Packages, nuts loose . In packages, with nuts	attached 71
On stove bolts freigh	at allowed up to
35c. per 100 lb. based o	n Cleveland, Chi-

Large Rivets

1 72	tie. with the for			
		Base	per 100 Lb.	
F.o.b.	Pittsburgh,	Cleveland.	Chi-	
cago	Birmingham		\$3.75	

Small Rivets

4-in. Own For

are ered and De-

rcial ubes, 100

Lap Veld, Hot olled 12.38 16.58 18.35 23.15 28.66

(7/16 in, and smaller)

F.o.b. Pit	tsburgh,	Per Cent Off List Cleveland, Chicago,	
Birming	ham		

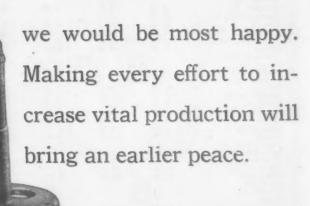
Cap and Set Screws Per Cent Off List 

### ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

3-lb. 15-lb. 20-lb.	coating coating	I.C I.C		20x28 in. \$12.00 14.00 15.00
---------------------------	--------------------	------------	--	--







have proven a dependable aid in increasing the production of machine tools. Install Gusher Coolant Pumps on your bottle-neck machines NOW.

Shown here is our new model HL-15025-B.

Send for new catalogue showing complete line of models.

Model HL-15025-B

1821 READING ROAD

CINCINNATI 2, OHIO

The "GUSHER" - A Modern Pump for Modern Machine Tools

### PIG IRON

All prices set in bold face type are maximums established by OPA as of February 14, 1945. Other domestic prices (in italics) are delivered quotions per gross ton computed on the basis of the official maximum. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Basic Bessemer		Low Phosphorus	Charcoal	
Everett, Mass	\$26.50 28.50 27.53 26.84 \$26.00 26.00	\$26.00 28.00 27.03 26.34 \$25.50 25.50	\$27.50 28.53 27.84 \$27.00 27.00	\$27.00 29.00 28.03 27.34 \$26.50	\$31.74	*****	
Swedeland, Pa. Steelton, Pa. Birdebore, Pa. Sparrows Point, Md.	26.00 26.00 26.00 25.00	25.50 25.50 25.50 25.50 24.50	27.00 27.00 26.00	26.50 26.50 25.50	\$30.50 30.50		
Neville Island, Pa	25.00 25.00 25.00 25.00	24.50 24.50 24.50 24.00	25.50 25.50 26.00	25.50 25.00 25.00 25.50	30.50	*****	
Canton, Ohio. Mansfield, Ohio. St. Louis Chicago	26.39 26.94 25.50 25.00	25.89 26.44 25.00 24.50	26.89 27.44 25.50	26.39 26.94 25.00	33.69 33.86 36.46	\$37.3	
Granite City, III. Cleveland Hamilton, Ohio Toledo	25.00 25.00 25.00 25.00	24.50 24.50 24.50 24.50	25.50 25.50 25.50	25.00 25.00 25.00 25.00	33.42		
Youngstown Detroit. Lake Superior, fc. Lyles, Tenn., fc. (2)	25.00 25.00	24.50 24.50	25.50 25.50	25.00 25.00	33.42	34.00	
St. Paul. Duluth. Birmingham. Los Angeles.	27.63 25.50 21.38 27.95	27.13 25.00 20.00	28.13 26.00 26.00	25.50 27.63	38.69		
San Francisco. Seattle. Prove, Utah Montreal. Toronto	27.95 27.95 23.00 27.50 25.50	22.50 27.50 25.50		28.00		****	

(1) Struthers Iron & Steel Co., Struth ers, Ohio, may charge 50c. a ton in exce of basing point prices for No. 2 foundry basic, bessemer and malleable.

Fire Cla Super-dui First qua First qua

Sec. qual Sec. qual No. 1 Ol Ground f

Silica B Pennsylva Chicago Silica cer

Chrome

Standard Plymoi Magnesi

Standard Chemical

Grain M

Domestic in sach

Domestic

Standard No. 1 Angle sr (F.o.b. 1 Light ra

Cut spil

Cut spil
Screw sp
Tie plate
Tie plate
Track be
Track be
roads
Track be
Basing

Chica-plates— Ohio. W Chicago,

City, A Pacific Steelton. Youngst Oregon

C

(Per l

Chrom

Forging Plates Structur

eets Hot rol Cold ro Drawn

Straigh

F.Billeti Bars . Plates

eets Hot str

Chrom

Plates

Sheets

Field g

Electric Motor Dynam Transfe Transfe Transfe

F.o.b b. on dynamo

(In bu

RA

(2) Price shown is for low-phosphore iron; high phosphorus sells for \$38.50 the furnace.

Basing point prices are subject switching charges; Silicon differential (not to exceed 50c. a ton for each 0.1 per cent silicon content in excess of ba grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction 38c. per ton for phosphorus content 0.70 per cent and over; Manganese differentials, a charge not to exceed 50 per ton for each 0.50 per cent manganes content in excess of 1.00 per cent. Effe tive March 3, 1943, \$2 per ton extra me be charged for 0.5 to 0.75 per cent nick content and \$1 per ton extra for each additional 0.25 per cent nickel.

### METAL POWDERS

electrolytic, unannealed, 300 electrolytic, unannealed, 300 to 3k

\*Freight allowed east of Mississippi.

			(	CC	)	KI									- 1
Furnace,	bech	ive	(f.	.0.1		0	Ye	181	)						Net To
Connells	ville.	P	8.				•								\$7.90
Favette	Co	W	. 9	Va.											8.19
Connells	ville.	13	2												8.26
Foundry.	Rv-	2 PO4	ine	œ.											
Chicago,	del	d													13.35
Chicago,	f.o.	b.													12.60
New Er	elar	d	de	Pd							ì		0		14.25
Kearny,	N	T.	20	h							Ċ	•			12.69
Philadel	nhia	d	110	1	١.					*		*			12.85
Buffalo,	dal	4	C8 N					*		8			8	8	13.00
Portsmo	neth.	Oi	in			h							•		11.10
Palnesvi	He.	Oh	10,		0	h			0.0		0		0	9 1	
Erie, de	ne,	Ou	10,	ñ.	U,	u.		0	0 0	0	0	0		0 1	18 75
Erie, de	La							8	*	*	*	*	*		1 9 90
Clevelan	a, a	er d				8.3		*	0.0	8		*	8		10 65
Cincinna	IEI.	ael.	a			6. 9		8				8		5 5	19.00
St. Loui	3, 04	ar.a						*		*					10.00
Birming	ham,	d	el°C								8	8			16.84
Hanc	idri	LWI	0	ve.		3 1	u	31	ពរ	8	τ	r	ш	CH	ted chi
permitte									0	I	96	T		E	DE DE
A															

### CAN BE MARKED AT TEMPERATURES as low as 150°F as high as 1800°F

Marks Won't Run, Fade, Smear or Burn Off

MARKAL PAINTSTIKS are the recognized "MUST" in more and more plants requiring the permanent marking of hot metals. They're positive, weather-proof, fadeproof, easy to use, always ready for instant use. Can be applied under blinding heat. After cooling, marks will not peel, crack or dis- com color. Marks are removed in sign MARKAL pickling bath. PAINTSTIKS



1600° F. Ingot being marked with MARKAL PAINTSTIK at Inland Steel Co.

also made for all Cold Surface Markings'

WRITE FOR SAMPLES . GIVE FULL DETAILS

Chicago 12, III.

### REFRACTORIES

(F.o.b. Works)

275	411-	10-2-L
rire	LIGT	Brick

50

tia 0.9 ba

nt) n t all

500

5 140

330

420

pl.

8.10

Per 1000
Super-duty brick, St. Louis \$66.55
First quality, Pa., Md., Ky., Mo., Ill. 52.85
First quality, New Jersey 57.70
Sec. quality, Pa., Md., Ky., Mo., Ill. 47.95
Sec. quality, New Jersey 52.55
No. 1 Ohio 44.30
Ground fire clay, net ton 7.80
Silica Brick
Pennsylvania and Birmingham\$52.85
Chicago District Birmingham\$52.85
Chicago District 60.65
Silica cement, net ton (Eastern) 9.25
Chrome Brick
Per Net Ton
Standard chemically bonded, Balt
Plymouth Meeting, Chester \$54.00
Magnesite Brick
Standard, Balt. and Chester \$76.00
Chemically bonded, Baltimore 65.00
Cools Massocite
Grain Magnesite
Domestic, f.o.b. Balt. and Chester
in sacks (carloads) \$43.48
Domestic, f.o.b. Chewelah, Wash.
(in bulk) 22.00

### RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb.,
No. 1 O.H., gross ton \$43.00
Angle splice bars, 100 lb 2.70
(F.o.b. Basing Points) Per Gross Ton
Tight well (form bill to
Light rails (from billets) \$43.00
Light rails (from rail steel) 39.00
Base per Lb.
Cut spikes 3.00c.
Screw spikes 5.15c.
The plate steel 9 150
Tie plate, steel 2.15c.
Tie plates, Pacific Coast 2.30c.
Track bolts 4.75c.
Track bolts, heat treated, to rail-
roads 5.00c.
Track bolts, jobbers discount 63-5
Basing points, light rails, Pittsburgh,
Chicago, Birmingham; cut spikes and tie
plates-Pittsburgh, Chicago, Portsmouth,
Ohio, Weirton, W. Va., St. Louis, Kansas
City, Minnequa, Colo., Birmingham and
Pacific Coast ports; tie plates alone-
Steelton, Pa., Buffalo. Cut spikes alone-
Youngstown, Lebanon, Pa., Richmond,
Oregon and Washington ports, add 25c.

### CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)
Chromium-Nickel Alloys

No. 302
20.40c.
24.00c.
27.00c.
24.00c.
34.00c.
21.50c.
28.00c.
24.00c.

DISMIT M	17.60		10.00C.	24.00C.
Straight-	Chromi	um All	oys	
P.Billets Bars Plates Sheets Hot strip Cold strip	15.725c. 18.50c. 21.50c. 26.50c. .17.00c.	16.15c. 19.00c. 22.00c. 29.00c. 17.50c.	22.50c. 25.50c. 32.50c.	30.50c. 36.50c.
Chromiu				No. 304
Plates Sheets			d picklin	.19.00c.

**ELECTRICAL SHEETS** 

(Base, J.o.o. Pittsourgh)	
Per I.	b.
Field grade 3.20	le.
Armature 3.55	
Electrical 4.05	
MOTOR 4.32	
Dynamo	
Transformer 7% 6.12	
Transformer 65 7.16	ic.
Transformer 58 7.6	ic.
Transformer 52 8.4	
F.o.b. Granite City, add 10c. per 1	00
b. on field grade to and including	
dynamo. Pacific ports add 75c. per 1	00
lb. on all grades.	

· SUGGESTION FOR **CUTTING COSTS** ow and in the SUGGESTION BOX

### **Look Into Everything ROLLER CONVEYORS** Can Do . . . Ask STANDARD CONVEYOR

THE steps you take now - the investment in equipment that you may make to cut handling costs will not only pay dividends immediately but can be expected to yield equal or even greater returns in postwar days to come, when handling and other unproductive costs will be under the closest scrutiny.

For example, roller conveyors installed now will be useful in many ways no matter what you may be making or handling when peacetime is here. Roller conveyors are unequal-led in low first cost, flexibility and minimum operating expense. They handle a wide range of commodities -parts, packages, units, cartons, cans, bottles, barrels, bundles, drums, boxes. They are available in light, average, or heavy-duty types for either port-able or stationary use — in a wide variety of sizes, styles and lengths. Roller conveyors are built in their entirety by Standard, including the

vital bearings which are manufactured to the highest standards.

Besides roller, Standard builds belt, chain, slat, and push-bar conveyors, also spiral chutes, tiering and lifting machines, portable pilers, and pneumatic tube systems.

On any conveyor requirement Stan-dard Conveyor is equipped by experi-ence and facilities to recommend and furnish the right type of equipment.

### STANDARD CONVEYOR CO.

General Offices: North St. Paul, Minn.





TIERING AND LIFTING MACHINES



PORTABLE PILERS



SPIRAL CHUTES



PNEUMATIC TUBE SYSTEMS

Bethl

A TABLE	-FERROALLOT PRICES-	<b>◆</b>
Ferromanganese	High-Nitrogen Ferrochrome	Other Ferroalloys
78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale Rockwood, Tenn.	Low-carbon type: 67-72% Cr, 0.75% N. Add 2c. per lb. to regular low-carbon ferrochrome price schedule. Add 2c. for each additional 0.25% N. High-carbon type: 66-71% Cr, 4-5% C, 0.75% N. Add	Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained
Carload lots (bulk)       \$135.00         Carload lots (packed)       141.00         Less ton lots (packed)       148.50         \$1,70 for each 1% above 82% Mn;	5c. per lb. to regular high-carbon ferro- chrome price schedule.  Low-Carbon Ferromanganese	Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant,
penalty, \$1.70 for each 1% below 78%.  Manganese Metal	Contract prices per 1b. of manganese contained, lump size, f.o.b. shipping point, freight allowed to destination, Eastern	usual freight allowances, per lb. contained Va.  Open hearth \$2.70
Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight	Zone. Add 0.25c, for spot sales. Carloads, Ton Less	Crucible
allowed. Spot sales add 2c. per lb. 96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.	Bulk Lots Ton 0.10% max. C, 1 or 2% max. Si 23,00c, 23,40c, 23,45c.	Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's
Carload, bulk	0.15% max. C, 1 or 2% max. Si 22.00c. 22.40c. 22.65c.	plant, usual freight allowances, per lb. of cobalt metal \$1.50 Vanadium pentoxide, 88-92%
2.5% max. Fe. Carload, bulk	0.30% max. C, 1 or 2% max. Si 21.00c. 21.40c. 21.65c. 0.50% max. C, 1	V <sub>2</sub> O <sub>5</sub> technical grade, contract basis, any quantity, per lb. con-
L.c.l. lots	or 2% max. Si 20.00c, 20.40c, 20.65c, 0.75% max. C, 7.00% max. Si 16.00c, 16.40c, 16.65c,	tained V <sub>2</sub> O <sub>5</sub> . Spot sales add 5c. per lb. contained V <sub>2</sub> O <sub>5</sub> \$1.10 Silcaz No. 3, contract basis, f.o.b.
Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa. 16-19% Mn 19-21% Mn	Ferrochrome Briquets Contract prices per lb. of briquet, f.o.b.	producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)
3% max. Si 3% max. Si Carloads \$35.00 \$36.00 Less ton 47.50 48.50	shipping point, freight allowed to destina- tion. Approx. 60 per cent contained	Carload lots 25c. 2000 lb. to carload 26c.
Electric Ferrosilicon OPA maximum base price cents per lb.	chromium. Add 0.25c. for spot sales. Eastern Central Western Zone Zone Zone	Silvaz No. 3, contract basis, f.o.b. producer's plant with freight al- lowances, per lb. of alloy (Pend-
contained Si, lump size in carloads, f.o.b. shipping point with freight allowed.	Carload, bulk. 8.25c. 8.55c. 8.95c. Ton lots 8.75c. 9.25c. 10.75c. Less ton lots 9.00c. 9.50c. 11.00c.	ing OPA approval) Carload lots
Eastern Central Western Zone Zone Zone 50% Si . 6.65c. 7.10c. 7.25c. 75% Si . 8.05c. 8.20c. 8.75c. 80-90% Si . 8.90c. 9.05c. 9.55c.	Ferromanganese Briquets Contract prices per lb. of briquet, f.o.b.	Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over,
75% Si 8.05c. 8.20c. 8.75c. 80-90% Si. 8.90c. 9.05c. 9.55c. 90-95% Si. 11.05c. 11.20c. 11.65c.	shipping point, freight allowed to destina- tion. Approx. 66 per cent contained man- ganese. Add 0.25c. for spot sales.	max. based on rate to St. Louis No. 1
Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.	Eastern Central Western Zone Zone Zone	No. 79
Silvery Iron (C/L, Per Gross Ton, base 6.00 to 6.50 Si)	Carload, bulk. 6.05c. 6.30c. 6.60c. Ton lots 6.65c. 7.55c. 8.55c. Less ton lots . 6.80c. 7.80c. 8.80c.	Ton lots, per lb
F.o.b. Jackson, Ohio \$30.50 Buffalo 31.75	Calcium—Manganese—Silicon Contract prices per lb. of alloy, lump	basis, f.o.b. plant with freight allowances, per lb. contained Cb. 2000 lb. lots
For each additional 0.50% silicon add \$1 a ton. For each 0.50% manganese over 1% add 50c, a ton. Add \$1 a ton	size, f.o.b. shipping point, freight allowed to destination.  16-20% Ca, 14-18% Mn, 53-59% Si.	Under 2000 lb. lots \$2.30 Ferrotitanium, 40-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y.,
for 0.75% phosphorus or over.  Bessemer Ferrosilicon	Add 0.25c. for spot sales.  Eastern Central Western Zone Zone Zone	ton lots, per lb. contained Ti. \$1.23 Less ton lots \$1.25
Prices are \$1 a ton above silvery iron quotations of comparable analysis.  Silicon Metal	Carloads 15.50c. 16.00c. 18.05c. Ton lots 16.50c. 17.35c. 19.10c.	Ferrotitanium, 20-25%, 0.10%C. max., ton lots, per lb. contained titanium \$1,35
OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping	Calcium Metal Eastern zone contract prices per lb. of	Less ton lots
point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.	metal, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. Add 0.9c. for Central Zone; 0.49c.	20%, 6-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Missis-
Eastern Central Western Zone Zone Zone 36% Si, 2% Fe. 13.10c. 13.55c. 16.50c.	for Western Zone.  Cast Turnings Distilled Ten lots \$1.80 \$2.30 \$5.00	sippi River, North of Baltimore and St. Louis, per carload\$142.50 Ferrophosphorus, 18% electric or
97% Si, 1% Fe. 13.45c. 13.90c. 16.80c.  Ferrosilicon Briquets  OPA maximum base price per lb. of	Less ton lots. 2.30 2.80 5.75  Chromium—Copper	blast furnaces, f.o.b. Anniston, Ala., carlots, with \$3 unitage freight equalled with Rockdale, Tenn., per gross ton \$58.50
briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approxi- mately 40% Si. Add .25c. for spot sales. Eastern Central Western	Contract price per lb. of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi River. 8-11% Cr. 88-90% Cu, 1.00% max. Fe, 0.50% max. Si. Add	Ferrophosphorus, electrolytic 23- 26%, carlots, f.o.b. Monsanto (Siglo), Tenn., \$3 unitage freight
Zone Zone Zone Zone Zone Carload, bulk 3.35c. 3.50c. 3.65c. 2000 lbcarload 3.8c. 4.2c. 4.25c.	2c. for spot sales. Shot or ingot	equalized with Nashville, per gross ton
Silicomanganese Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight	Contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination. Add 5c, for spot sales. 17.50% min. B, 1.50% max. Si, 0.50% max. Al,	Langeloth, Washington, Pa., any quantity, per 'b. contained Mo. 95c. Calcium molybdate, 40-45%, f.o.b. Langeloth and Washington, Pa.,
allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C. Carload, bulk	0.50% max. C. Eastern Central Western	Mo
2000 lb. to carload	Zone Zone Zone Ton lots \$1.20 \$1.2075 \$1.229 Less ton lots 1.30 1.3075 1.329	Molybdenum oxide briquets, 48- 52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo 80c. Molybdenum oxide, in cans, f.o.b.
bulk freight allowed, per lb 5.80c. 2000 lb. to carload 6.30c.	Manganese—Boron Contract prices per lb. of alloy, f.o.b.	Langeloth and Washington, Pa., per lb. contained Mo 80c.
Less ton lots	shipping point, freight charges allowed. Add 5c. for spot sales. 75.00% Mn, 15-20% B, 5% max. Fe,	Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of
OPA maximum base contract prices per lb. of contained Cr, lump size in carload	1.50% max. Si, 3.00% max. C. Eastern Central Western	alloy. Add 4c. for spot sales Carload lots
lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.	Zone Zone Zone Zone Zone Less ton lots 2.01 2.023 2.055	lump f.o.b. plant usual freight allowances, per lb. of alloy Carload, bulk 4.6c.
Eastern Central Western Zone Zone Zone 0.06% C 23.00c. 23.40c. 24.00c.	Nickel—Boron Spot and contract prices per lb. of alloy, f.o.b. shipping point, freight allowed	Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload,
0.10% C 22.50c, 22.90c. 23.50c. 0.15% C 22.00c, 22.40c. 23.00c. 0.20% C 21.50c. 21.90c. 22.50c.	to destination. 15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, bal-	bulk 5.75c. Ton lots 7.25c. Simanal (approx. 20% Si, 20%
0.50% C 21.00c. 21.40c. 22.00c. 1.00% C 20.50c. 20.90c. 21.50c. 2.00% C 19.50c. 19.90c. 21.00c.	ance Ni.  Eastern Central Western Zone Zone Zone	Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate al-
66-71% Cr, 4-10% C 13.00c. 13.40c. 14.00c. 62-66% Cr.	11.200 lb. or more . \$1.90 \$1.9125 \$1.9445 Ton lots 2.00 2.09125 2.0445	lowed, per lb. Car lots 8.00c. Ton lots 8.75c.
5-7% C 13.50c. 13.90c. 14.50c.	Less ton lots 2.10 2.09125 2.0445	Less ton lots
130-THE IRON AGE, March 29, 1945		

# Elevating Screw for JANK GUN

The Army coils it an elevating screw. Its function: to elevate or depress the muzzle of an H. V. tank gun. Hundreds of them were urgently needed, made to close tolerances. The job was put up to Bethlehem.

Bethlehem's Lebanon, Pa., plant had made hundreds of special fastenings, but never anything quite like this elevating screw. Diameter: 1% in.; Length: 30% in. And with an eye forged on one end of the screw, and 20 in. of ground threads on the other.

From start to finish, the manufacture of one of these screws from bars of NE 8740 heat-treated steel involved twenty-two separate operations, each calling for high precision.

Bethlehem is currently making just about every kind of fastening imaginable—from small rivets to huge spikes—from common bolts and nuts to intricate "specials" like these elevating screws. War requirements have brought the need for many new types of special fastenings. Perhaps some of our experience gained in working out wartime problems can be put to good use solving fastenings problems for you in the postwar period.

BETHLEHEM STEEL COMPANY GENERAL OFFICES: BETHLEHEM, PA.

Bethlehem Steel Export Corporation New York City



Bethlehem makes every type of Fastening

# MULTIPLY MANPOWER WITH A BORE-MATIC!



Certainly these are no days to have your skilled men making unnecessary set-ups. That's why this example of a Heald Bore-Matic engineered for a particular production job, should interest you. It permits making 1 set-up do for as many as 4 precision operations.

More operations per set-up boosts production. But more than that, with a Bore-Matic you get improved relative accuracy of multiple surfaces. You decrease down time. Floor space is conserved. All-round versatility permits your Bore-Matic to handle boring, turning, facing, chamfering, grooving, and fly-cutting. You can machine

straight and taper surfaces; curves and irregular shapes. Perform all these operations singly, simultaneously, progressively or in combination. Besides, Bore-Matics often eliminates other finishing operations. They also can be used for roughing and semi-finishing.

ONE S

ONE S'

Piping boo

Even if you think you know the Bore-Matic story—let us bring you up to date on it. You'll find Bore-Matic performance facts pretty convincing proof that it is the precision answer to faster, better, less costly volume production.

THE HEALD MACHINE COMPANY WORCESTER 6, MASS.

HEALD

means more precision faster!
INTERNAL AND SURFACE GRINDING MACHINES
BORE-MATIC PRECISION FINISHING MACHINES

## Where the Call is for Piping Materials ....CALL ON CRANE

ONE SOURCE OF SUPPLY
ONE RESPONSIBILITY FOR ALL PARTS
ONE STANDARD OF QUALITY

No matter what you need in piping materials, you can get them all from a single source—your Crane Branch or Wholesaler. There, the world's greatest selection of piping materials—in brass, iron and steel—is at your service. Uniform quality in every part—backed by a single responsibility—helps assure the best installation. Take advantage of Crane complete piping materials service to speed up deferred replacement work and keep pipe lines at peak efficiency. Crane has everything you need; for example, in Standard Iron Body Wedge Gate Valves, as shown below.

Piping book-up for a battery of pumps



SERVICE RECOMMENDATIONS: Crone Standard Iron Body Wedge Gate Valves with Brass trim are recommended for steam, water or oil lines; all-iron valves for oil, gas or fluids that corrode brass but not iron. Made in O. S. & Y. and Non-Rising Stem patterns.

#### Working Pressures

Size of Valve	Screwed or Flanged Valves		Hub End Valves
	Saturated Steam	Cold Water, Oil, or Gas, Non-Shock	Cold Water or Gas Non-Shock
2 to 12 in. 14 and 16 in.	125 pounds 125 pounds	200 pounds 150 pounds	200 pounds 150 pounds
18 to 24 in.	*	150 pounds	150 pounds

<sup>\*</sup>For steam lines larger than 16-inch, Crane 150-pound Cast Steel Gate Valves are recommended.

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Ill. · Branches and Wholesalers Serving All Industrial Areas







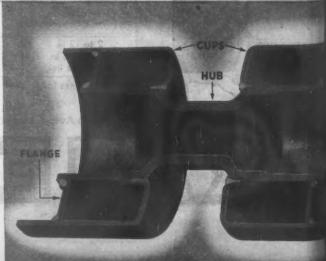
BOMBS BY THE MILLION made by spinning a hot piece of BEARINGS made of SHELRY Seamless Steel Tubing with a lining increases resulted from this method. . of this method.

seamless pipe and forming it into proper shape. Great production of bearing metal. High accuracy and fast production are advantages

GASOLINE REFINERIES use large quantities of NATIONAL ROLLER for half track made from scamless tubing welded to a Seamless Pipe for both pressure lines and for structural purposes. flange. Result: better rollers, higher production, fewer rejects.

Made in O.S. a. M. and Manday Sum personal





# What you can do today with SEAMLESS Pipe and Tubing

- \* TO SAVE LABOR
- \* TO SPEED UP WAR WORK
- \* TO SAVE STEEL

In the rush to produce more war materials faster, a number of new time- and labor-saving methods have been devised. It might be that *one* of these faster methods will help you whip up a lagging production line.

For higher output and greater uniformity, seamless tubing has often been substituted for forgings or solid stock. The usual result is a considerable saving in machine time, labor, and steel.

For example: bearings made from highquality Shelby Seamless Steel Tubing with a lining of bearing metal can be turned out quickly in large quantities.

Bomb production was speeded up tre-

mendously by spinning a heated piece of NATIONAL Seamless Pipe into the proper shape. This idea could be used for making other simple designs.

High strength, accuracy, and availability of Shelby Seamless Alloy Steel Tubing made possible the quick mass production of rocket projectiles, Bazooka projectiles, and jet propulsion airplane launching devices.

There have been many ingenious ideas developed that utilize seamless pipe and tubing to step up production and reduce rejects. Our engineers will be glad to consider with you how you might apply these ideas to your products.



#### NATIONAL TUBE COMPANY

Pittsburgh, Pa.

Columbia Steel Company, San Francisco United States Steel Export Company, New York



UNITED STATES STEEL

Buy More War Bonds and Stamps

Anough...on Time...

8-THE IRON AGE, March 29, 1945

Clayton Kenney

# and RIGHT!

THE war wouldn't wait—it has never waited—and today it's moving faster than ever. That's why, in the earliest, darkest days, the thousands of Americans at Jack & Heintz set their sights high on production of vital aircraft equipment—and will keep them there to the very end!

As the fighting turned slowly in our favor and now ... island by island ... mile by mile ... draws closer to the enemy homelands, the tempo goes up and up and up. Doubled, trebled, quadrupled production assignments roll in ... and the equipment rolls out at the same pace. Laboratory-precision products never before turned out in more than a few score are streaming to all fronts by the tens of thousands.

As a result of this intensive manufacturing experience, Jack & Heintz is today a group of several thousand time-conscious, production-minded people who have packed years of experience and know-how into months—broken all records in mass production of precision equipment—and kept faith with or beaten every deadline ever given them.

Just as this organization has kept pace with war, so it can help you in peace. For postwar competition won't wait, either—and the manufacturer who gets to market with enough . . . on time . . . and right will head the field.



Jack & Heintz Inc., Cleveland, Ohio, manufacturers of aircraft engine starters, generators, gyro pilots, gyro fiight instruments, magnetos, motors.

# ANOTHER WESTINGHOUSE MOTOR "FIRST"

# "No Lubrication

PRELUBRICATED BALL BEARINGS PRACTICALLY ELIMINATE BEARING MAINTENANCE...NOW STANDARD ON TYPE CSP MOTORS UP TO 3 HP

Twenty-two years ago Westinghouse was "first" with the "Sealed-Sleeve" Bearing that eliminated oil leakage, kept out dirt, and reduced maintenance on sleeve bearing motors. Today Westinghouse offers the first self-sealed, prelubricated ball bearing that eliminates lubrication for five years. Type CSP prelubricated motors bought now will need no lubrication until 1950.

Prelubricated bearings in Westinghouse motors have been thoroughly field-tested in thousands of Westinghouse lint-free textile motors. Recently a series of bearings was chosen at random and inspected from a group of 600 motors, the first of which were installed between six and seven years ago. All were in perfect condition—even though they had been in operation 24 hours a day and had never been lubricated.

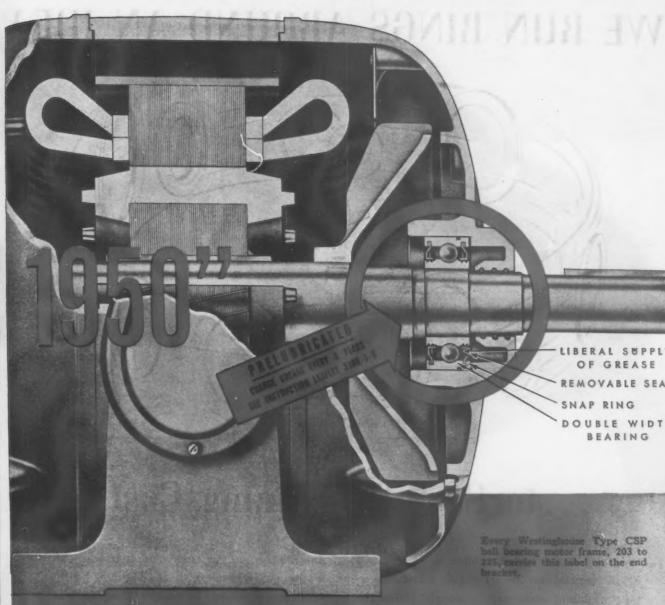
Time-tested special applications such as these have often paved the way for improvements in standard motors. Type CSP motors incorporate the fruits of wide Westinghouse motor application experience. When you buy a Westinghouse Type CSP motor, you get all the latest improvements. For complete information, write for DB 3100-CSP, Westinghouse Electric & Mfg. Co., P.O. Box 868, Pittsburgh 30, Pennsylvania.

#### ADVANTAGES

OF WESTINGHOUSE TYPE CSP MOTORS

- FRELURRICATED SEALED BALL BLAR-INGS reduce Jubication maintenance
- ... assure longer grease life.
- . IMPROVED TUFFERNELL INSULATION
- . DYNAMICALLY-BALANCED ROTOR.
- a DIE-CAST ROTOR with oversize fun.
- LIBERAL THROUGH-VENTILATION air enters front, leaves at drive-end of motor.





DOUBLE WIDTH BEARING

Westinghouse

PRELUBRICATED SEALED BEARING CONSTRUCTION

... retains original grease packing within the stationary seal discs. Bearing chamber accommodates grease sufficient for more than five years of severe service. Hald by map rings, seal discs fit closely over inner race, forming an efficient seal. Snap rings and discs are easily removed to permit packing new grease in bearings.

TYPE CSP MOTORS

#### WE RUN RINGS AROUND AN IDEA



#### ... to Save Machining Costs

New ideas, new machines, often mean new and bolder demands on the art of ring fabrication so that machining costs may be brought within the realm of reason . . . a challenge which we have met as our stock in trade for more than half a century.

We have been making Dresser Couplings for 65 years . . . products which demand accurate fabrication through rolling, welding and sizing of many circular shapes . . . setting new standards for roundness, flatness, and flawless strength. Today this "know-how" is solving knotty design problems in urgent war production-and now is available to solve your problems.

Dresser has the equipment and engineering skill to produce rings of varied section up to 96 inches in diameter, depending on sectional dimensions . . . at such close tolerances that machining is reduced to a minimum. Send us your inquiry, or write for booklet "Rings for War". Dresser Mfg. Division, Dresser Industries, Inc., Bradford, Pa.

#### Dresser Rings

. . a new way to lower machining costs and save materials.

Typical is this odd-section ring, which saves hours of machining time compared to conventional methods.

DRESSER RINGS and FORGINGS

## MICROMETERS

For Many Uses:

Above - SCREW THREAD MICROM-ETER CALIPER No. 155RS Micrometers for measuring threads and for other special work available in several stock styles.

Distinctive design features give Brown & Sharpe micrometers definite advantages. The micrometer screw, uniformly accurate from end to end — the wear resisting spindle of high carbon, high chromium steel — the adjustable thimble which provides an extremely simple adjustment for measuring surfaces — the alternately long and short graduations and large figures for easy reading. Brown & Sharpe Micrometer Calipers mean measuring excellence.

In addition to the complete line of Micrometer Calipers, there are Inside Micrometers, Micrometer Depth Gages and Micrometer Heads that cover most measuring needs. Catalog No. 34 listing complete line sent on request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

At Left - MICROMETER CAL-IPER No. 63RS. Measures 2" to 3" by thousandths.

Above — MICROMETER CALIPER No. 13RS. Measures 0 to 1" by ten-thousandths. Cutaway frame at anvil end permits measurements deep in slots.

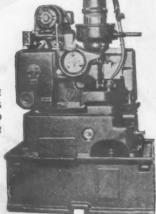
We under buying through the Distributor

At Left — MICROMETER CAL IPER No. 71RS. Measures 6' to 7" by thousandths. Scien tifically designed frame re sists distortion and is ligh in weight. Similar tools in sizes to 12"

BROWN & SHARPE TOOLS SOME SIMPLE

PRE-SHAVED
ON RELLOWS

7-TYPE
. FELLOWS
HIGH SPEED
GEAR SHAPER



THE FELLOWS METHOD ... MACHINES AND TOOLS FOR

14-THE IRON AGE, March 24, 1945

# on Pre-Shaving

HIGH-ACCURACY

When emphasis on high production is permitted to interfere with the necessary care and attention to the pre-shaving operation, overall costs are increased, and high-accuracy is sacrificed.

To obtain the best results, both the pre-shaving cutter, as well as the shaving tool, should in most cases be designed especially for the job. The amount of stock and its distribution on the tooth profile should be closely controlled. Variations in size in the pre-shaved gears also put an excessive load on the shaving tool, dulling it prematurely and making

uniform results difficult to obtain.

Many gear manufacturers have found that the Gear Shaper and Gear Shaper Cutter presents the best and surest way to obtain satisfactory pre-shaving results.

Our engineers and service men have solved many difficult gear shaving problems, and will gladly assist in helping you if given the opportunity. For further information, write The Fellows Gear Shaper Company, Springfield, Vermont, U. S. A. — or 616 Fisher Building, Detroit, or 640 West Town Office Building, Chicago.



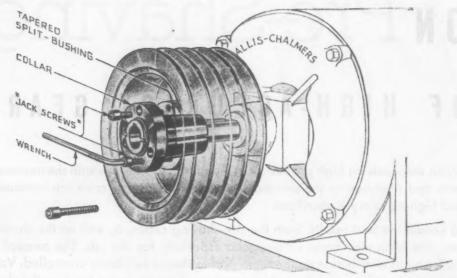
For gears up to 7-inches Pitch Diameter the 7-A Type High Speed Gear Shaper answers the most exacting requirements.



ALL OPERATIONS FROM BLANK TO FINISHED GEAR

## X-Ray View

OF ALLIS-CHALMERS' NEW "MAGIC-GRIP" SHEAVE



Fastest mounting and demounting sheave on the market, the new "Magic-Grip" costs you nothing extra.



Remove three capscrews from bushing collar. A handy wrench — supplied with each sheave—is the only tool needed to remove Allis-Chalmers' new "Magic-Grip" from motor or machine shaft quickly and easily.



Insert two capscrews in tapped holes. As screws are turned, they become levers . . . automatically breaking tight grip of tapered split bushing on sheave and shaft. Entire unit is then ready for removal.



Remove sheave from shaft.
Requires no mallet, no prying, no bulging muscles. You just slide the sheave off...smoothly, quickly. It costs nothing extra! Send for B6310. Allis-Chalmers, Milwaukee 1, Wis.

A 1770

Allis-Chalmers Texrope
MAGIC-GRIP"



**SHEAVES** 



ALTHOUGH for many years, GARDNER has built countless special or semi-special machines, in addition to the conventional types of Disc Grinders, it is perhaps not so well known that Surface Grinders like that shown above, are also available.

Hydraulic tables, or Hand-operated tables, as in this case, are mounted on a standard Disc Grinder base, and several sizes of tools, ranging from 18" up to 40" dia. wheels, can be furnished. Combination units, carrying a surface table on one end, and a standard lever-feed table on the other, are a handy variation in this type of equipment.

Keep GARDNER SURFACE GRINDERS in mind they produce many flat surface jobs quickly—and accurately!

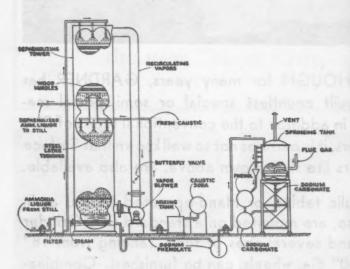
If YOU have work for a SURFACE GRINDER, write for full details!



# KOPPERS and Steel

#### CUTTING CORROSION BY REMOVING H2S

To protect millions of dollars worth of steel-making and magnesium-smelting equipment from corrosion, this Koppers Thylox plant was built to remove hydrogen sulfide from coke-oven gas and to recover sulfur which may be used as a base for fungicides and for sulfite paper manufacture. The coke-oven gas contained 250 grains of hydrogen sulfide per 100 cubic feet, 97% of which was removed by the system. removed by the system.



#### RECOVERING PHENOL FROM AMMONIA LIQUORS

The Koppers Vapor-recirculation Dephenolization Process has enabled coke-plant operators to remove phenols from ammonia liquors and recover them at a profit. The system removes 95% phenol and recovers 90% of it as sodium phenolate. Koppers is building benzol-process dephenolization equipment for treating the effluent from a plant carbonizing 8 000 pet tops of coal per day. bonizing 8,000 net tons of coal per day.

#### KOPPERS

(THE INDUSTRY THAT SERVES ALL INDUSTRY)

BUY WAR BONDS . . . AND KEEP THEM!

KOPPERS COMPANY, INC., PITTSBURGH 19, PA.



#### APPLYING ROOFING OVER STEEL DECKS

Koppers Roofing Specification Book, just distributed to roofers and architects, contains four specifications for applying built-up coal tar pitch roofing with insulation over steel decks. It also has 26 specifications for various types of roofs over other kinds of decks and complete waterproofing and dampproofing information. We will be glad to send you a copy.

18-THE IRON AGE, March 29, 1946



3. Exact constancy of grain structure

4. Rigidly controlled chemical and physical properties

5. Record of performance in war-front products that assures a home-front preference

Write for test sample.



STEEL CO.

WEIRTON. W. VA. Sales Offices in Principal Cities

Division of NATIONAL STEEL CORPORATION Executive Offices, Pittsburgh, Pa.





# When you modernize... USE A GEARMOTOR



W.P.B. indicates that we'll all be pushing war production for many months. And then the heat goes on reconversion.

Much of your equipment, running at peak load since 1941, probably needs to be replaced or modernized. Whichever you need . . . replacement or modernization . . . use a gearmotor when the drive requires speed reduction. Here's why.

A gearmotor is the most efficient means of speed reduction available today. It's more compact...lasts longer with less maintenance... is easier to install...lower in over-all cost... and

safer for your employees. These advantages are not idle claims . . . for they've been proved in actual industrial installations.

Westinghouse offers a complete line of gearmotors for any speed reduction application from 1 to 75 hp. Each unit is specifically designed to conform to industry-wide A.G.M.A. standards. Each new unit contains many improved exclusive design features. Call your nearest Westinghouse office for details. Westinghouse Electric & Manufacturing Company, P. O. Box 868, Pittsburgh 30, Pennsylvania.

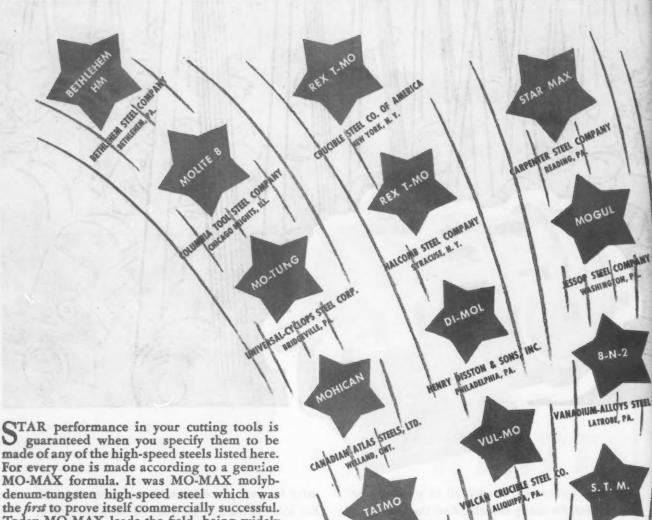


Westinghouse Gearmotors

Four out of five drives need speed reduction

THESE HIGH-SPEED STEELS ARE YOUR ASSURANCE OF

# STAR PERFORMANCE



LAT OBE ELECTRIC STEEL CO

LMW

ALLEGHENY LUGLUM STEEL CORP.

PITTSBURGH, PA.

made of any of the high-speed steels listed here. For every one is made according to a genuine MO-MAX formula. It was MO-MAX molybdenum-tungsten high-speed steel which was the first to prove itself commercially successful. Today MO-MAX leads the field, being widely used in tool bits, forming tools, circular saws, milling cutters, broaches-and for other applications demanding supreme toughness and resistance to abrasion.

FOR COMPLETE INFORMATION . . . send for the NEW 1945 MO-MAX HANDBOOK. In it you'll find examples of tool performance -how and why MO-MAX was developed-how to select MO-MAX for your job-and many other facts you'll want to know about this unusual steel. Your copy will be mailed upon receipt of your name and company connection. Write today to Dept. A.

THE CLEVELAND TWIST DRILL CO. 1246 East 49th St. Dept. A Cleveland 14, Ohio

THEY'RE ALL



SIMONDS SAW & STEER CO.

LOCKPORT, N. Y.

MO-CUT

BRAEBURN ALLOY STEEL CORP.

BRAEBURN, PA.

Why is

a good name in industry?

A business institution acquires a fine reputation, not because of its size, not because of the dividends it pays, not because of the patents it holds; but because of the acceptance of its products and methods of doing business by prospects, by customers, and by its employes.

For over fifty years prospective customers for Folk products have been gracious in their acceptance of Falk representatives.

Actual customers have purchased and repurchased Falk products year after year.

Falk employes are proud to be associated with the Falk Corporation, and verify their pride by many years of service.

This is evidenced by the Navy's acceptance of Falk products since before World War I; by the attitude of the Falk management toward Falk employes during the lean years of the economic cycle; by the honors bestowed upon Falk officials; by recognition of the high standards of its employe relations accorded by a national magazine; and by interplant and office activities of the employes themselves.

It has long been an axiom of the Falk manage ment that "to build a better product, first improve the man." Falk quality is due in no small measure. to the thoroughness of Falk apprenticeship courses.

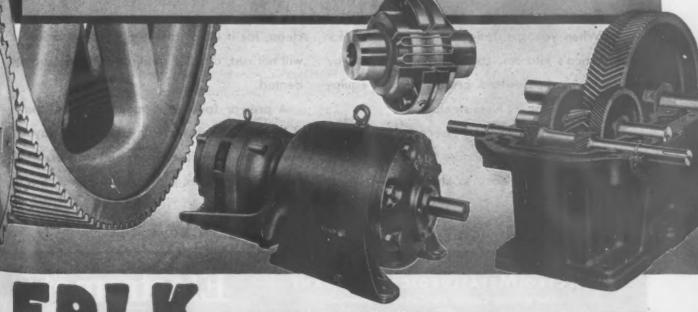
The same thoroughness employed in molding men is employed in molding Falk material. Falk casts its own steel in its own foundry to its own specifications.

To secure the watch-like precision so characteristic of all that Falk produces, it has always been the Falk policy to design its own machinery.

Because Falk has always known its men, its material, and its tools, it logically follows that Falk engineering has always been better than it could have been, had this engineering been done with unknown components.

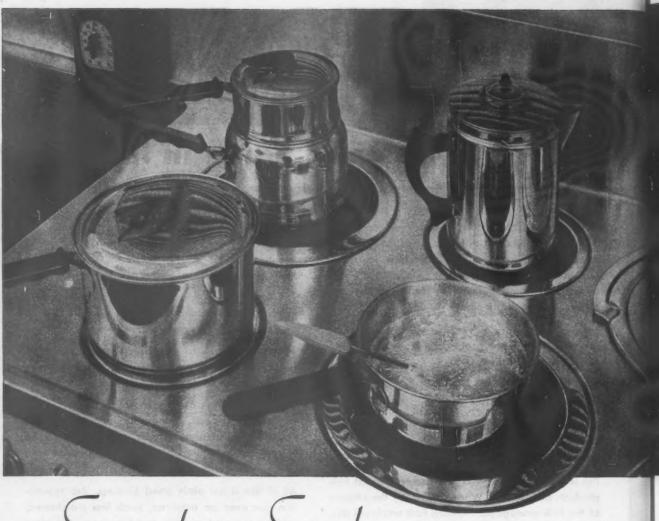
All of this is just plain good business. No reputa-7ion can ever be acquired, much less maintained, unless it is based on plain good business. For plain good business is business that is good first for the customer, then for the employe, then for the corporation-and only then for the management.

This is why Falk is "a good name in industry".



GOOD NAME

THE FALK CORPORATION, MILWAUKEE 8 WISCONSIN District Offices, Representatives, or Distributors in principal cities



Stainless Steel

#### HAS CONSUMER APPEAL

When you are designing new products for America's kitchens, consider the reasons why so many housewives prefer kitchen equipment made of stainless steel.

They like stainless steel because it is bright and attractive and because it stays that way. It is sturdy. It is easy to clean and to keep clean, for it is not affected by food acids. It will not rust, chip, or peel, and it is not easily dented.

A prewar favorite in many kitchens, stainless steel is even more in demand today as housewives have found how well stainless steel equipment endures years of daily use.

**BUY UNITED STATES WAR BONDS AND STAMPS** 

#### ELECTRO METALLURGICAL COMPANY

Unit of Union Carbide and Carbon Corporation
30 East 42nd Street

The New York 17, N. Y.
In Canada: Electro Metallyraical Campany at Canada, Limited, Welland, Onlario

Electromet
Ferro-Alloys & Metals



Lay Set Preformed is in there pitching!



When peacetime expansion programs get under way—HAZARD LAY-SET PREFORMED WIRE ROPE will be in there pitching. LAY-SET Preformed is the relaxed, limber rope that is willing to bend or reverse bend any way you wish. It is the rope that is almost eager to work; the rope which resists kinking, snarling or whipping; which doesn't fight the man who is trying to handle it. More than this, LAY-SET is safer to handle because worn and broken crown wires refuse to wicker out to jab men's hands or tear clothing. Specify Hazard LAY-SET Preformed for your next line. You'll find it the greater-dollar-value rope.



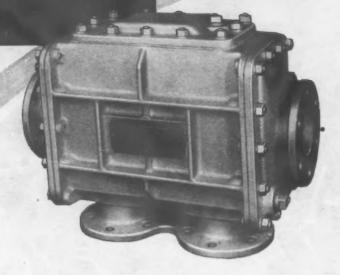
Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma, Bridgeport, Conn.



HAZARD WIRE ROPE DIVISION
AMERICAN CHAIN & CABLE

In Business for Your Safety

# HARRISON OIL COOLERS



#### Help Eliminate Shutdowns-Costly Repairs

When lube oil temperatures become too high, there is the probability of damage to tools and machines, resulting in costly repairs and loss of much needed war production.

If oil temperatures are kept within bounds, proper lubrication is insured—excessive wear eliminated—and production stepped up.

In many types of industrial applications, the installation of Harrison Oil Coolers has achieved these results.

Write for recommendations regarding your specific heat control problem.

Don't Quit Now-BUY WAR BONDS HARRISON

HARRISON RADIATOR DIVISION OF GENERAL MOTORS, LOCKPORT, NEW YORK

A Fleet operator reports on Magnesium



W. D. COCHRAN FREIGHT LINES

Aluminum Company of America, 735 N. Water Street, Milwaukee, Wisc.

IRON MOUNTAIN
MICHIGAN
Home Office
PHONES-597-598

December 26, 1944

Dear Sir:

Attention: Mr. W. R. Butler This afternoon I had occasion to inspect one of the light weight semi-

This afternoon I had occasion to inspect one of the light weight semi-trailers and I thought you would be interested in knowing the condition of the I have had to operate these trailers under conditions trailers and I thought you would be interested in knowing the condition of the trailers at this time. I have had to operate these trailers under conditions that would amphasize any defeats in the material or markmanshin, if any existent trailers at this time. I have had to operate these trailers under conditions that would emphasize any defects in the material or workmanship, if any existed. In the manufacture of these semi-trailers, we used mostly aluminum

In the manufacture of these semi-trailers, we used mostly aluminum and magnesium alloys only in the top rails that extend along the side of the body and also the roof cross pieces. I was particularly interested in checking the find out if there was any corrosion. I checked all very carefully and body and also the roor cross pieces. I was particularly interested in checking these to find out if there was any corrosion. I checked all very carefully and found no corrosion of any kind.

In no place did the material tear, either where riveted to the side ad sheets or to the roof cross pieces. I have always been skeptical

In no place did the material tear, either where riveted to the side corrugated sheets or to the roof cross pieces. I have always been skeptical was very pleased to find that it did not tear. I think his jal properly. was remove worry about corrosion. magnesium alloy asphalt pai o see that all grease inc chromate and mere the chemicals aterial. None was information. 10UGUTON | IRONWOOD | ISMPRMING | IRON RIVER | Phone 136 | Phone 136 | Phone 787 WDC: MI

Very truly yours,

W. D. COCHRAN FREIGHT LINES, By Bell Coche SPECIALIST IN C



GNESIUM AMERICA

CORPORATION

AMERICA BUBSIDIARY ALUMINUM COMPANY 9 0

THE IRON AGE, March 29, 1945-27

#### SALKOVER METAL PROCESSING



Opper Brazing (Hydrogen Brazing) process will continue to be used extensively in postwar metal product manufacturing, as it is so widely used in wartime. As the country's largest commercial copper brazing organization, our long and varied experience should prove beneficial to many manu-

facturers who wish to investigate the quality improvements and cost reductions which usually follow the adoption of this advanced fabrication method.

This service is intended chiefly to assist companies located so far from our plants that shipment is impracticable..., or to aid organizations with such great volume that handling on a commercial basis is economically unsound.



We are ready now to work with you on war er postwar projects. plif

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Please address our Chicago plant.

Salkover

METAL PROCESSING

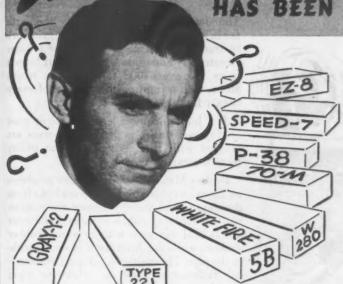
COMMERCIAL ELECTRIC FURNACE BRAZING

4209 W. Lake St., Chicago 24, Ill.

34-16 Borden Ave., Long Island City 1, N. Y.

# the Art of Buying ARC WELDING ELECTRODES

HAS BEEN GREATLY SIMPLIFIED ...



It used to be ..

a puzzling situation — those electrodes with confusing trade names and trade numbers. Each manufacturer's identification system was different, each one had his own special name for electrodes. Thus, for example, one particular rod designated by American Welding Society as E-6012 had over twenty different trade names. And no two trade names were even vaguely similar. To a welder selecting a certain rod for a definite job these varying trade names were disconcerting. They had no connection with any standard welding classification. Unless he had previously used the rod or took time to check into its classification, he was at a loss to select the correct electrode.

cut through this mass of confusion and greatly simplified the business of buying electrodes. Official AWS classification numbers have been adopted for Allis-Chalmers electrode identification. Thus AWS E-6012 becomes Allis-Chalmers E-6012 in the A-C electrode line. It's logical and practical. Correct se-

lection is automatically assured.

Shop-tested and production-proven in A-C's own huge plants, these electrodes are available now at Allis-Chalmers welding dealers and district offices.

Write for bulletin B6340.

A 1780

#### **ALLIS-CHALMERS**

MILWAUKEE 1, WISCONSIN





#### HEADQUARTERS FOR WELDING EQUIPMENT



AMPAC A-C WELDERS



WELD-O-TRON D-C WELDERS



ALLIS-CHALMERS
ELECTRODES



ARC WELDING
ACCESSORIES

#### UNDERGROUND AGENT ON A PUBLIC MISSION

DRESSER

Thunderous tons of traffic shake the earth far below our city streets. The vast gridwork of transportation pipes for gas and water vibrates day and night. In one of our largest cities are over 7000 miles of gas mains alone, with a joint on the average of every twenty feet.

If a joint springs a leak, the street must be dug up; traffic is detoured; nerves are jangled with hammering, and the utility foots the expense.

Dresser Manufacturing Division produces an ingenious pipe Joint to prevent leaks from developing and thereby reduce the maintenance troubles of public services. Bellmaster Joints seal the pipe with armored rubber gaskets, while the Joint itself is sealed within the pipe. These simple, compact, economical Bellmasters give an otherwise rigid stretch of pipe such flexibility that it can move and absorb the punch of modern traffic.

The Bellmaster Joint is an adaptation of the basic Dresser idea for flexible pipe couplings. This idea was a major contribution to the gas, oil and water industries, aiding them to give uninterrupted service from generation to generation. Another piece of fundamental engineering by one of the Dresser Industries.

#### THE PLUS OF DRESSER INDUSTRIES

Back of every product of Dresser Manufacturing Division stands DRESSER INDUSTRIES, INC.—strengthening the resources; co-ordinating and stimulating engineering, production and distribution for its member companies. This is the Plus of Dresser Industries. To the customers of every Dresser member this Plus is passed on through the products they buy—a Plus Value. Dresser Industries, Inc., Terminal Tower, Cleveland 13, Ohio.

ROOTS-CONNERSVILLE Blower Corp., Connersville, Ind.

STACEY BROS. Gas Construction Co., Cincinnati, Ohio

BOVAIRD & SEYFANG Mfg. Company, Bradford, Pa.

DRESSER Manufacturing Co., Ltd., Toronto, Ont., Canada

VAN DER HORST Corp. of America,

Olean, N. Y. and Cleveland, Ohio

DRESSER Mfg. Division, Bradford, Pa.

BRYANT Heater Company, Cleveland, Ohio

CLARK Bros. Co., Inc., Olean, N. Y.

PACIFIC Pumps, Inc., Huntington Park, Calif.

INTERNATIONAL DERRICK & Equipment Co., Columbus, Marietta and Delaware, Ohio; Beaumont, Texas; Torrance, Calif.

DRESSER INDUSTRIES



FROM the beginning of the war ammunition for American cannon was delivered in fibre contain-

But the fibre can't keep out moisture indefinitely. In the Pacific areas thousands of shells required renovation because threads on shells and fuses were corroded.

Now Youngstown steel sheets are being used in thousands of steel shell containers, similar to the 105 mm. mortar shell container shown here.

These steel containers are replacing fibre containers in areas where high humidity penetrates the fibre. They are also used in amphibious operations where shells are unloaded from shipboard into the water, and subsequently are picked up at low tide.

Steel containers not only are water-tight and air tight, but also cost less than fibre containers with necessary crating. The Army now uses them for seven different sizes of ammunition.

This war-time use of steel containers emphasizes the many advantages of Youngstown sheet for peacetime packaging. Thousands of manufacturers can use Youngstown sheet steel to give their products absolute protection in low-cost, long-lived, modern containers.



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#### YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

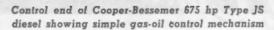
YOUNGSTOWN, OHIO

Manufacturers of

CARBON - ALLOY MAND YOLOY STEELS

Electrolytic Tin Plate-Coke Tin Plate-Pipe and Tubular Products-Sheets-Plates-Conduit-Bars-Rods-Wire-Nails-Tie Plates and Spikes-Alloy and Yoloy Steels.

# Just a Part-turn Que Switching from itself a remark



# ... qud-Your Diesel

Cooper-Bessemer's new and sensational development, the gas-or-oil diesel, not only makes virtually any combustible gas an ideal fuel, safe and entirely practical, but the downright simplicity of switching from one fuel to the other is in itself a remarkable feature. It offers revolutionary possibilities in its application to numerous power requirements.

#### TO POWER USERS THIS DEVELOPMENT MEANS:

- Diesels with all their inherent advantages, may now be operated with full efficiency on natural gas, sewage gas, refinery gas, manufactured and coke oven gases, etc., in preference to engines of the electrical ignition type.
- Gas-fueled engines may now be utilized in locations where an electrical ignition system has heretofore been a preventative hazard.
- 3. Since the thermal efficiency of a Cooper-Bessemer diesel is so much higher than that of the best gas engines of the other type, 20 to 25% less fuel will be required for a given power output. Or, correspondingly more work can be done with a fixed or limited fuel supply.
- A single, surprisingly simple control permits instantaneous change-over to oil fuel or vice versa at continuous full load.

- 5. Fluctuating or insufficient gas supply may be compensated for by the simultaneous use of both fuels in any desired proportion, readily controlled.
- Gas-oil proportion or complete fuel change-over may be automatically controlled to conform exactly with fuel supply and load requirements.

Engineers and operating officials in many industries will instantly recognize the tremendous economies and revolutionary advantages made possible by this new Cooper-Bessemer development.

Cooper-Bessemer

Corpor A Tron

Mi Vernen, Ohio Green City Pa.

NEW YORK WASINGTON HOUSTON DALLAS TULSA SHREVEPORT LOS ANGELES ST. LOUIS SEATTL

BUILDERS OF DEPENDABLE ENGINES FOR 112 YEARS

### CINCINNATI 9, OHIO faced . . . similar operations are performed on four cored ciency at the Nordberg Manufacturing Company plant, through whose courtesy this photo was obtained. The setup illustrated -showing a Super Service Radial in action-calls for a around each crankshaft bearing are drilled, reamed and backholes between finished ends. Some of the holes are as large number of operations on Diesel engine beds. Six cored holes are produced for new Victory Ships under noteworthy effias 4" dia. by 23" in length; all are within close tolerancesattesting to the capacity, accuracy and convenience of the MARINE DIESELS Super Service Radial in heavy duty war production. OAKLEY, SUPER SERVICE "RADIAL CINCINNATI BICKFORD TOOL COMPANY, annoli-



These carburized parts for the Jacobs 450-hp aircraft engine show some of the heat-treating problems which can be simplified when Homo Methods of carburizing and tempering are used. In the ring gears, distortion-prevention is the main consideration; in the clusters, uniform case is vital; in the crank, a principal problem is depth of case; in the liners, maximum hardness is required. And, always, smooth surface is obtained.

# LOW-REJECT HEAT-TREATING BY THE 3 HOMO METHODS

In planning their production of trainer-plane engines at Plant Two, the Jacobs Aircraft Engine Co. of Pottstown, Pa., deliberately set out to hold rejects down to a record-making "low".

Production records and equipments in other plants were investigated, and when Jacobs finally settled on a certain way of performing an operation, they knew in advance what results to expect.

So, there has been little surprise over the performance of the Homo Method equipments for carburizing, nitriding and tempering; but the results definitely speeded up our country's supply of trainer-plane engines, at a time when it can be said without exaggeration that these engines were desperately scarce. For the engine parts entrusted to Homo Methods are heat-treated exactly as specified; heat-treatment runs for days at a time, with tens of thousands of parts handled without a reject. In the Homo Nitriding Furnace, no piece has ever been rejected and the 100% inspection is particularly severe, because Jacobs stresses the long service which engines give before repairs are necessary.

The Homo Methods are described in detail, with many pictures, in our various Catalogs, sent on request. For Homo Carburizing, ask for Catalog T-623; for

Nitriding, Catalog T-624; for Tempering, Catalog T-625.

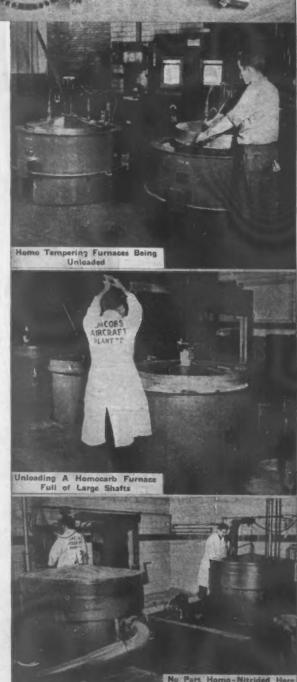
Jrl Ad T-620(18)



LEEDS & NORTHRUP COMPANY

4956 Stenton Avenue. Philadelphia 44. Pa.

LEEDS & NORTHRUP



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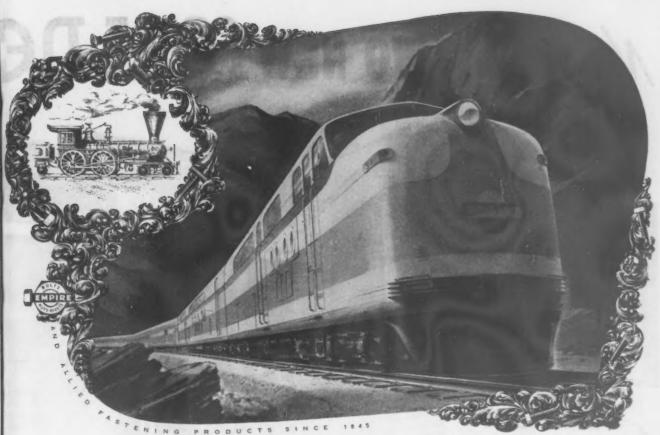
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These are the things that make America strong...the industries that RB&W has served during its 100 years of developing better fasteners for better products.

The Railroads....

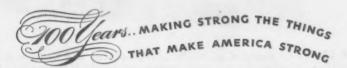
CHOO CHOO TO SWWISSH!

You hardly see one of today's streamlined fliers before—swwissh—it's practically out of sight!

What a contrast—in speed, comfort and appearance—to laboring, hard-chugging trains of 100 years ago... trains which were also the miracles of their times... There is still one important element of construction that the pioneer trains and the latest models have in common—the use of RB&W bolts and nuts.

Around the middle of the last century, RB&W EMPIRE provided the quality that railroading in those days required... and, as the railroads' requirements became more severe through the years, RB&W quality was ready to meet those new requirements.

From the invention of the first automatic cold-header nearly a century ago, RB&W has invested many fortunes in research and development work, equipment and plants. And from these investments has come the meation of a host of new processes and methods for producing fasteners of even greater strength and accuracy—of better appearance and finish—of maximum dependability... Entering its second century, RB&W has great plans for further developments that will be important news to the transportation industries and others that have always looked to RB&W for the quality that makes their quality products easier to assemble and stronger and better in service.





RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Factories at: Port Chester, M.Y., Corcopolis, Po., Rock Folls, III. Sales affices at: Philadelphia, Detroit, Chicago, Chattanooga, Los Angeles, Portland, Seattle. Distributers from coast to coast. The Industry's most complete, easiest-to-use cololog.

# Now ready TWO NEW MILIE WA

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- at 1000 Constance St., N.S. The Pittsburgh Office will remain as heretofore at

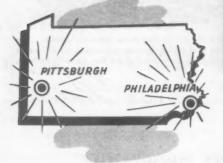
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> **Telephone: ATlantic 2171 Teletypewriter PG97**



Pennsylvania and surrounding industrial areas.



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The Philadelphia Office, formerly at the Bourse Bldg., has been moved to the WAREHOUSE. Send all inquiries and correspondence to the above new address.

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BELL SYSTEM TELETYPE connects all Milne warehouses - to save valuable time in tracking down available supplies of scarce steels-another reason why Milne service is faster.

## WAREHOUSES in Pennsylvania

America's leading Tool Steel specialists expand distribution facilities to provide stepped-up service to the entire Middle-Atlantic area

Milne Steel distribution service to the metalworking and mining industries is a record of prompt, resourceful cooperation that dates back over 57 years.

Now, with five complete warehouse stocks strategically spotted in the nation's most important industrial areas, Milne is better equipped than ever before to get you the steel you need and get it to you FASTER.

Milne experienced tool steel experts can help you select the proper steel to speed production and lower costs. And with up-to-the-minute information on steel availability, Milne representatives can save you delays, keep you informed on changes in the supply outlook.

Milne's KOLORKOTE system of Tool Steel grade identification distinguishes each steel at a glance. The entire surface of the bar is covered with a bright lacquer color. The smallest piece is identified, storage space minimized, inventory simplified. HEAT TREATING INSTRUC-TIONS are attached to each shipment.

Troublesome reconversion supply problems will make Milne's convenient warehouse service more important than ever to you. Save time, save trouble, save expense . . . call Milne!

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KOLORKOTE TOOL STEELS High Speed, Alloy, and Carbon

HOLLOW, SOLID, AND AUGER DRILL STEELS for all mining and excavation work

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TIMKEN GRAPHITIC STEELS

**Machines Faster** 

Wears Longer

STRESSPROOF STEEL

T.M.Reg.U.S.Pat.Off. COLD DRAWN - FURNACE TREATED "More than just strain-relieved." "HIGHER IN-THE-BAR PHYSICALS"

also carried in Marchouse Stock.



HYDRAULIC PRESSES AND VALVES FOR EVERY PURPOSE R.D. WOOD CO. 400 CHESTNUT STREET PHILADELPHIA 5, PA.



## OVER THE YEARS

RESCENT Electric Industrial Trucks are the materials Crescent NCRE: This Crescent NCRE, shown houling 5,000 pounds of copper A handlers for speed and dependable service. They provide the electrified handling that keeps pace with electrified production . . . are built rugged for long life. Crescents hold parts replacement bills to remarkable "lows" . . . and their precision engineering results in smooth performance which provides worthwhile savings on batteries and tires.

wire, is used as a yard truck. One of the most flexible of all trucks, the NCRE provides high lifting, tiering and trailing. This model with 62" liftoverall height, 83"—will operate successfully inside a standard box car. Made in 4,000 and 6,000 lbs. capacities.

CRESCENT TRUCK COMPANY 1100 Willow St., Lebanon, Pa.

Free, Up-to-the-Minute Catalog will help you to select the right Crescent Electric Trucks for your materials handling. In-cludes photographs of all current models, specifications and engineering drawings. Send for your free copy today.



ELECTRIC TRUCKS AND TRACTORS Industrial Truck and Tractor Specialists Since 1917



When our Army's tanks, tractors and self-propelled big guns were being built, it was found that no V-Belts built by anyone before the war could stand the service that is now being delivered on the battlefield by V-Belts that Gates has developed especially for these heavy combat units. And Gates is building these V-Belts entirely of synthetic rubber.

\* The fact that Gates developed these have because every because every first or the second track of the second tr

delivered to you.

BOTTOM RO

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As you know, wartime improvements in many other products must be withheld from general use until after the war is won-but victory depends so directly upon production, and production so directly upon V-Belts which drive the producing machines, that Gates has been able to give you immediately in your Standard Gates Vulco Ropes, every V-Belt improvement which Gates specialized research has developed for use on the Army's motorized equipment.

These are the simple reasons why you are finding that your Standard Gates synthetic rubber Vulco Ropes are today giving you better service than any V-Belts that were ever built before the war.



#### THE GATES RUBBER COMPANY

Engineering Offices and Jobber Stocks in All Large Industrial Centers

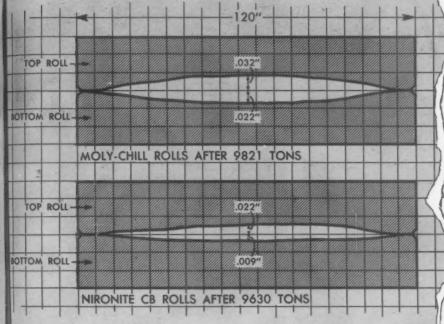
CHICAGO 6, ILL. 549 West Washington. NEW YORK CITY 3, 215-219 Fourth Avenue ATLANTA 3, GA., 738 C. & S. National Bank I LOS ANGELES 21, CAL., 2240 E. Washington Blvd. DENVER 17, COLO., 999 S. Broadway DETROIT 4, MICH., 8663 Grand River Ave. PORTLAND 9, ORE., 333 N.W. 5th Ave. DALLAS 2, TEXAS, 1710 N. Market St. SAN FRANCISCO 3, CAL, 1090 Bryant S



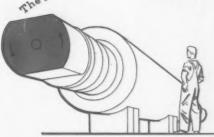
# The fact of the matter:

ANY STANDARD PLATE ROLL

REPRESENTATIVE MILL TESTS SHOWING COMPARATIVE WEAR



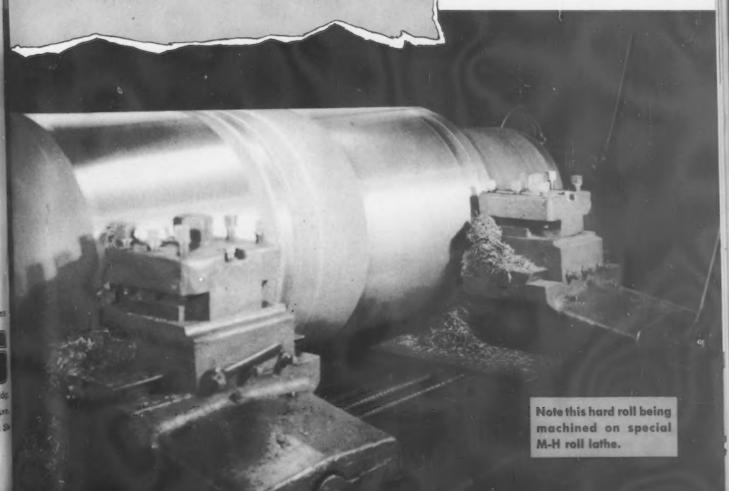
The rolls with the Red Wabblers



Remarkable wear resistance, freedom from fire cracking, tremendous strength -yes, anyone can use those words BUT -in actual service M-H Nironite Rolls repeatedly demonstrate wearing qualities that far exceed the record of any previously used standard rolls . . . M-H knows mills. They have been the originator of practically every major roll development. They advocate and practice machine roughing of rolls followed by light finish grinding, in contrast to wholly grinding from the rough. This eliminates the danger of weakening the surface structure by the generation of excessive heat in localized areas ... Leading plate mills everywhere are saving time and production dollars and producing better finished products with Nironite CB Rolls. Write for quotation.

### MACKINTOSH-HEMPHILL CO.

Pittsburgh and Midland, Penna.



# 15 holes in 15 minutes

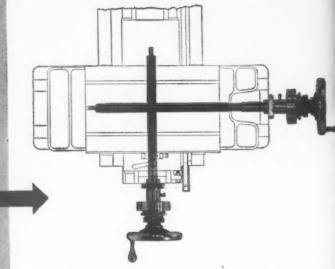
Spotted, Drilled and Reamed to ±.0002"

by the

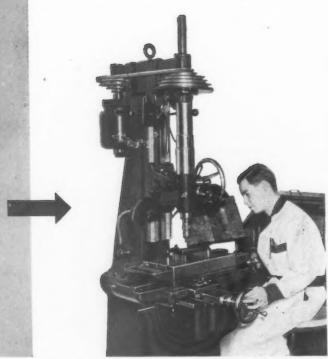
Coordinate Hole Location Method\*



...because
Micrometer Lead Screws
Accurate to
.0002" in 16 inches



... Speed Table Settings on the MOORE JIG BORER



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velo

\*One boring cut to increase accuracy to = .0001" would require only five minutes additional time for all fifteen holes. Write for descriptive literature.



MOORE JIG BORER

MOORE SPECIAL TOOL CO., INC., 736 Union Avenue, Bridgeport 7, Conn.



Radiography made the impossible possible ... and profitable!

He made a series of castings ...x-rayed each ... got a stepby-step picture of what was wrong ... perfected his technic ... and delivered a sound casting.

RECENTLY a motor manufacturer designed a radically different type of crankcase. It was simpler and lighter than conventional designs and could be machined fast and economically.

Four foundrymen were called in to do the job. Two refused, said it would be impossible to cast. The other two agreed to try, but one gave up at the end of three weeks, said it couldn't be done. The other was meeting with success. He was x-raying each pilot casting, making a step-by-step analysis of shrinkage difficulties, eliminating them as they developed. Result? He developed a trouble-free casting technic that enabled him to sup-

SHRINKAGE REVEALED in the exhaust port of one of the experimental castings.



SHRINKAGE ELIMINATED as result of step-by-step development of casting technic.

ply all the crankcases originally scheduled for the job from the four foundries.

This is just another one of the many valuable ways radiography is serving industry. In addition to doing an outstanding job of non-destructive inspection, radiography is pointing the way to designers in reducing weight, safely... to engineers in specifying more efficient alloys and manufacturing methods, with assurance... and to fabricators

in the use of new assembly technics of proved merit.

The increase in quality, lowering of cost, and speeding up of production, resulting from the increased use of radiography, will be particularly important in meeting tomorrow's opportunities. Eastman Kodak Company, X-ray Division, Rochester 4, N. Y.

RADIOGRAPHY

Analyzes . . . Instructs . . . Corrects . . . Improves

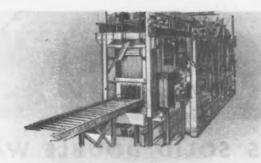
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Lebanon ALLOY AND STEEL Castings



# Would you Consider a

# Furnace Builder COMPETENT

# IF HE HAD A RECORD LIKE THIS?

eveloped the	Developed the	Developed the	Developed the
Removable Heating Element	Continuous Short Cycle Malleable Iron Annealing Furnace	"Globar" Equipped Forging Furnace	Return Pusher Block Furnace
Developed an	Pioneered the	Pioneered the	Developed the
Improved Method of Producing Gas for Carburizing Steel	Use of Electricity for Heat Treat Furnaces	Use of Nickel Steel for Furnace Roller Rails	Vertical Electrical Furnace for Heat Treating Ring Gear

If you as a manufacturer decide to install a heat treat furnace for production operation, you can't afford to make a mistake in choosing an organization to design and build that furnace. The cost, the engineering, and the time involved are all too important. It must be a competent organization.

If the prospective furnace engineers could establish the above record of accomplishment -would there be much doubt of their competency?

# **HOLCROFT & COMPANY**

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CHICAGO—C. H. Martin, 1355 Peoples Gas Bldg.
CANADA—Walker Metal Products, Ltd., Walkerville, Ont.



# INVESTIGATE BUNDYWELD STEEL TUBING

# ITS SOLID DOUBLE WALL CONSTRUCTION MEETS ALL TESTS

### HOW BUNDYWELD IS MADE



Bundyweld Tubing is made by a process entirely different from that used in making other tubing. A single strip of copper-coated S.A.E. 1010 steel is con-tinuously rolled twice laterally...



.. into tubular form. Walls of uniform thickness and concentricity are assured by the use of close tolerance cold rolled strip. This double rolled strip passes through a furnace where the . . .



copper coating fuses and ys with the double steel 3 alloys with the double steel walls. After brazing and cooling, it becomes a solid double wall steel tube, copper brazed throughout 360° of wall contact . . . dout, free from scale, and closely held to dimensions. Hard or annealed in standard sizes up to \$\( \gamma^{\text{o}} \) O.D. Special sizes cold drawn. Also furnished in Monel.



I HIGH FATIGUE STRENGTH



2 CLOSE TOLERANCES



3 HIGH BURSTING STRENGTH



### SEND FOR THIS BOOKLET ON SMALL DIAMETER TUBING

Of particular value to production and design engineers interested in hydrau-lic, lubricating and fuel lines. 16 pages of technical data and fabricating infor-mation on Bundyweld steel and Bundyweld Monel tubing with complete description of the double flare.

RUNDY TUBING CO. 10958 Hern, Detroit 13, Michigan Gentlemen: Forward my copy of the Bundyweld Booklet to Name\_\* Title

Company\_ Address. \_\_Zone\_\_\_State\_



4 EASY FABRICATION

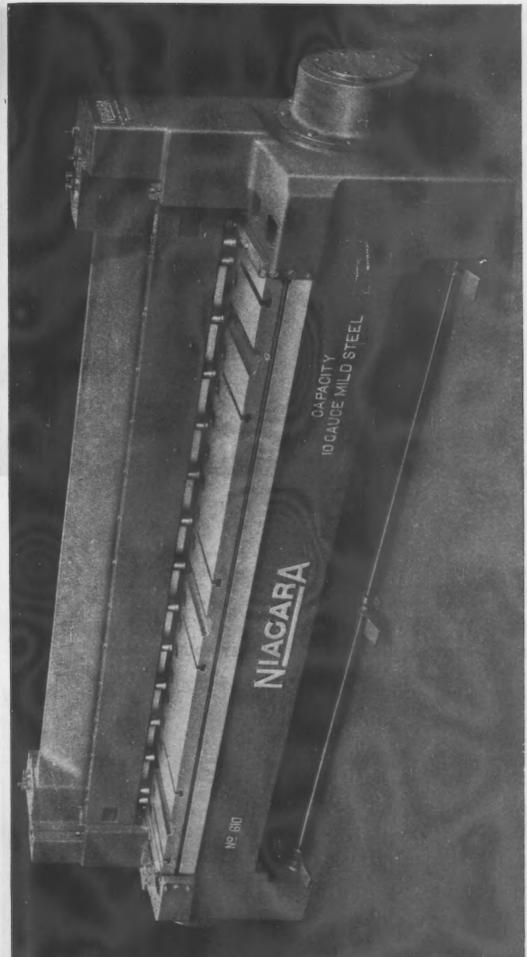
YOUR EXPECTATIONS

BUNDY TUBING DISTRIBUTORS AND REPRESENTATIVES:-

Pacific Metals Company, Ltd.
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Eagle Metals Company 3628 East Marginal Way Seattle 4, Washington



Enclosed drive with gears, clutch and eccentrics running in oil assure long life and low maintenance cost. Four-edge, solid tool steel knives are standard equipment. Niagara Machine & Tool Works, Buffalo, N. Y. District Offices: Detroit, Cleveland, New York.

Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Stears. Also factory regrinding service by the same skilled men who grind new Niagara knives.

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# STATES UNITED

War plants are obtaining more production per man-hour with Niagara Power Squaring Shears because of accurate cutting, quick setting, ball bearing, self-measuring parallel back gages, full visibility of cutting line, instant acting Niagara sleeve clutch and other modern features.

# SI SERVICE DE LA PROPERTIE

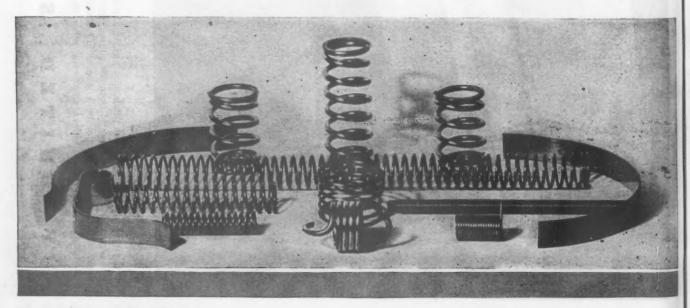
for a to v
W visic plan of e arch fabrand you

bly Plant, of the world's l buildings. Tons of strusteel deliver the rate of tons per me

PHOSPHOR BRONZE

Just a fraction of a percent of phosphorus converts a copper-tin mixture into "phosphor bronze"—an alloy unlike either of its constituents. Toughness, lasting resilience and high corrosion resistance immediately become its major characteristics. These qualities make it an excellent material for springs in electric snap switches, meters, measuring instruments and innumerable other devices that must function on their own, and often under extremely corroding conditions.

THE SEYMOUR MANUFACTURING CO., SEYMOUR, CONN.





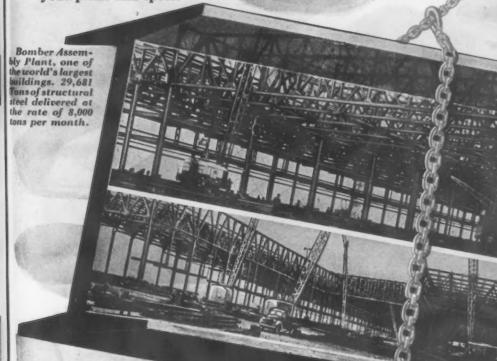
"ALLIED delivered every section of structural steel on schedule..."



Rapid, precision fabrication of mass tonnage for steel structures is Allied's contribution to vital industrial expansion.

When engineers and layout men who have vision and creative ability ally with large plant facilities and a quarter-century of experience in getting down to cases with architects, engineers, and contractors—fabricating service becomes a fast-moving, co-ordinated effort.

Your structural steel problem will find quick and satisfactory solution here. Send your plans and specs.





Three companies, with total structural steel capacity of 75,000 tons, who have pooled their facilities under centralized control and responsibility.

COMPANIES

Engineers • Fabricators • Erectors

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- GAGE STRUCTURAL STEEL CO., 3123-41 S. Hoyne Ave., Chicago 8, III.
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Address the company nearest you







This photograph shows a table fork blanking die produced by Olofsson Tool and Die Company.

# Everyday Necessity

Good taste in selecting your table service is a source of pride to you. Corresponding good judgment must be used by the manufacturer in selecting the proper equipment to do the job. Blanking dies required to produce millions of forks must be of unusual quality and endurance. Olofsson produces dies, jigs and gages that develop and finish special "mammoth or midget" machinery.

Olofsson

TOOL AND DIE COMPANY

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CHICAGO ENGINEERING OFFICE-600 SOUTH MICHIGAN AVENUE



# Hold that line!

### A thought on peace-time busiless that helps war production

Stabilized, maximum employment is not only possible, it's essential if we are to maintain our American standard of living and you can do something about it—now.

We Suggest This . . . (1) Determine four minimum needs to begin post-war business. (2) Place unrated orders for these accessary materials to be delivered when testrictions permit. (3) Advise your customers to follow this same plan.

Here's Why . . . (1) This plan permits suppliers to anticipate your needs and begin earlier production on them. (2) It also gives you a backlog to start you off when Uncle Sam cancels his orders. (3) Employees knowing of your activity in this respect will be more content and interested in their work—they'll feel more secure about your business offering peace-time jobs. (4) Your staff will be oriented in their thinking and less susceptible to vague reconversion worries.

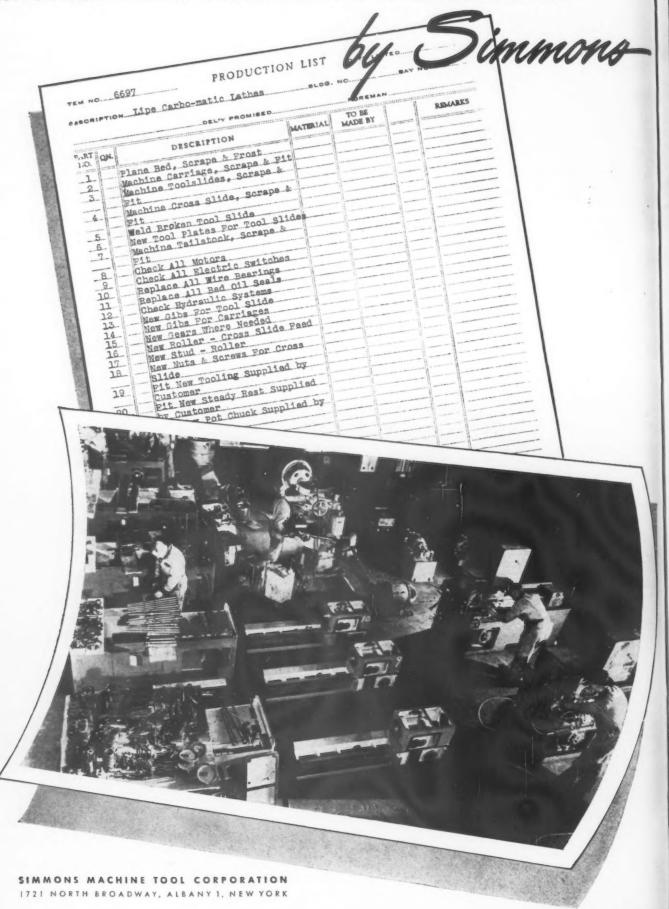
With all business following this plan, the

gap will be shortened. Depleted world markets will be more quickly exploited. Those 55 million peace-time jobs needed for an ideal post-war economy will be much closer to actuality.

Remember . . . Good management always sees its responsibility to the overall national welfare. As C.E.D. reports, "the companies that are doing the best on war contracts are the same ones that are doing the best post-war planning." For reprints of this ad, write Heppenstall Company, Pittsburgh 1, Pennsylvania.

HEPPENSTALL, the most dependable name in forgings

## ANOTHER TYPICAL ENGINEERED REBUILDING JOB



HOW

MANUFACTURERS OF STANDARD AND SPECIAL-PURPOSE MACHINE TOOLS . ENGINEERED REBUILDING SIMMONS

What About
HAMMER

HOW ARE THESE ERIE HAMMERS
REST USED IN FORGING PRACTICE?

Can you guess the carpacity of this Erie Hammer?

@ Can you identify this
Erie and tell where its use
is most effective?

Can you identify this

Can you identify this

Erie Hammer and recognize

Erie Hammer and recognize

its application to a definite

its application to a definite

class of forging work?

Can we help you on your specific forging equipment need now?

Write us in detail, and we shall try.

This is a 1500 lb. Erie Single Frame for general blacksmith.

Admmer, steam operated in the forging for general blacksmith.

Admmer, steam operated in the forging for general blacksmith.

Admmer, steam operated blacksmith.

Admmer, steam operated in the forging for general blacksmith.

A 7500 lb. Erie Four Roll Board Drop Hammer Moll Board Drop Hammer Most effective for making most effective fullering.

A 35,000 lb. Erie Steam aircraft hammer forginis illustration.

HERE THEY ARE IN FORGING



OWRITE FOR BULLETINS
ON ERIE HAMMERS AND
TRIMMING PRESSES
ERIE FOUNDRY COMPANY

ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA

RIE BUILDS Dependably

HAMMERS

# Custom tailor for a suit of armor

PPLYING braided armor or shielding to wire, tubing, conduit or hose, is a custom tailoring job. Braiding can be applied directly to material to be covered, or the metal braid can be furnished in suitable lengths for the user to apply in his own plant during assembly operations.

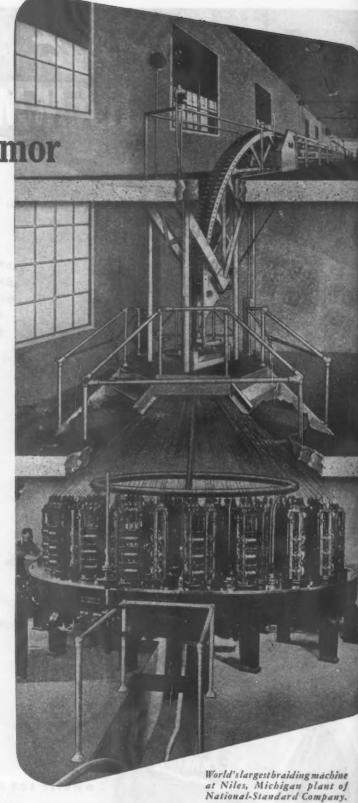
To provide the desired flexibility and other characteristics such as uniform coverage, resistance to mechanical abuse, resistance to elongation, or enlargement of diameter, braiding wire must be applied at precisely the correct angle and there must be no variation from this . . . from start to finish of the job.

That's why for fine radio wire 1/16" in diameter, or 16" steam expansion joints, more and more companies are calling upon National-Standard for their wire braiding work. For, we at National-Standard have the knowledge and experience necessary to give you a custom tailored job of braiding to meet exactly your particular requirements.

Today at National-Standard we have machinery available to braid steel, brass, copper, stainless steel, and monel metal. Let our 30 years of experience in the wire and wire fabricating industry help you with your braiding problem.

Buy and Keep War Bonds and Stamps





Divisions of National-Standard Company

NATIONAL-STANDARD CO. Niles, Mich.

TIRE WIRE, FABRICATED BRAIDS AND TAPE

THE ATHENIA STEEL CO. Clifton, N. J. COLD ROLLED, HIGH-CARBON

SPRING STEEL 0 WORCESTER WIRE WORKS Worcester, Mass.

ROUND STEEL WIRE, SMALL SIZES



WAGNER LITHO MACHINERY CO. Hoboken, N. J.

LITHOGRAPHING AND SPECIAL MACHINERY



Constantly controlled tension under all conditions, vital to satisfactory results in handling coiled steel, is obtained automatically in this mill by means of Reliance Motor-drive with all-electric, centralized control.

The uncoiler is kept under proper tension during all speed changes, and during the progressing reduction in coil diameter. At the same time, delivery tension is maintained as the coil increases on the recoiler.

In ease and simplicity of operation, improved quality as well as quantity of production, this application of Reliance Motor-drive has more than paid its way in comparison to former methods. If you would like to investigate the many possibilities of all-electric control, why not talk with a Reliance application engineer?

# RELIANCE ELECTRIC & ENGINEERING COMPANY 1083 Ivanhoe Road • Cleveland 10, Ohio

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# RELIANCE De MOTORS

"Motor-Drive is More Than Power"

# HALLOWELL

of STEEL for LIFETIMES

The famous "Hallowell" Line comprises a variety of shop and plant necessities to meet practically every need. To thousands of users all over the country, "Hallowell" Equipment signifies sturdy steel construction, good design, years and years of wear, and attractive prices.

"Hallowell" Work-Benches of Steel are an asset in any shop. Exceptionally strong and sturdy, they are built to stand firm and rigid without costly bolting to the floor. Over 1300 ready-to-use combinations with interchangeable sections make it possible for "Hallowell" Benches to fill almost any requirement promptly and economically.

"Hallowell" DeLuxe Shop Furniture of Steel is a smart addition to the "Hallowell" Line. Designed in a number of arrangements to meet the specific needs of modern shops, DeLuxe Benches have interchangeable shelf, cabinet and drawer units. DeLuxe Tool Cabinets and Foremen's Desks are also available.

To be informed about the many styles and models of "Hallowell" Equipment, send for the "Hallowell" Catalog of Shop Equipment.





"HALLOWELL"
TOOL STAND

Fig. 705

"HALLOWELL" STEEL STOOL

Fig. 1249



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"HALLOWELL"
STEEL
TRUCK

"HALLOWELL"

De Luxe

WORK-BENCH

OF

STEEL

Flg. 1734



# STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 523

BRANCHES: BOSTON . DETROIT . INDIANAPOLIS . CHICAGO . ST. LOUIS . SAN FRANCISCO

OVER 40 YEARS IN BUSINESS

# THEIR ULTIMATE STRENGTH and TOUGHNESS To a cost year blank there is no grain flow. Toughness T

The sketches portray the fundamental character of forgings as compared with parts produced by other methods. Only in forgings will you find the tough fibrous grain structure, with the grain flow advantageously directed throughout the piece, and the fibre structure concentrated at the points of greatest shock and stress.

Here is the "secret," known to hammersmiths for hundreds of years, of the far greater resistance of forgings to tensional and torsional stresses. As forgings are metal in an intensely compressed state, they are likewise highly resistant to compression and impact. Forged parts also rank high in fatigue resistance and useful life. Measured in service per dollar expended, forgings are economical.

For the advanced, speedier and more trouble-free

machines of tomorrow, a broader use of forged parts is definitely indicated. Forgings provide important savings in weight because parts of smaller sectional thickness may be safely used. Forgings require a minimum of machining, and the forging process eliminates internal defects which might cause sudden breakdown or failure.

When you need flat die, drop or upset forgings, let our more than a hundred years of experience help you as it has hundreds of aircraft and ordnance builders during the war era.

### KROPP FORGE COMPANY

5301 W. Roosevelt Road Chicago (50), Illinois

Engineering Representatives in Principal Cities





357 PAYNE AVENUE, NORTH TONAWANDA, NEW YORK

(Between Buffalo and Niagara Falls)

GEORGE F. WALES, President

Specialists in Punching and Notching Equipment



# PROVIDE A BALANCED PRODUCTION LINE FOR FAIRCHILD CAMERAS



At Fairchild Camera and Instrument Corporation, production lines require quick changes in operations. Drilling, tapping, reaming, and counter-boring of all sizes of aerial camera parts are some of the important jobs assigned to Walker-Turner Drill Presses. These rugged, simple tools are readily moved from one department to another, or within departments, as needed. Because of Walker-Turner flexibility, all operation changes can be made quickly — regardless of size of part. Thus a steady flow of urgently needed camera parts is maintained.

WALKER-TURNER CO., INC., PLAINFIELD, N. J.

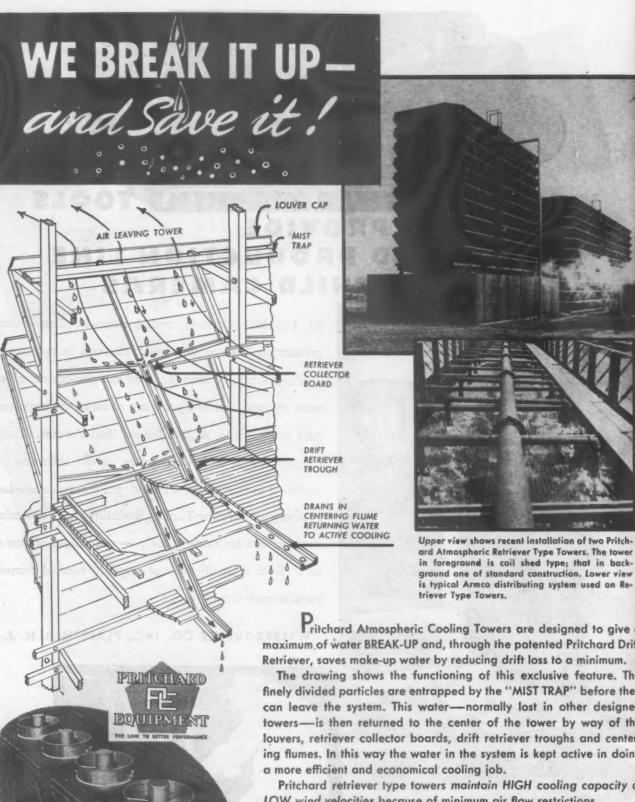
15" DRILL PRESS drilling and reaming hales for locating pins on Fairchild aerial camera lens cone. One of many Walker-Turner Drill Presses in this plant

WALKER-TURNER RADIAL DRILL drilling fairchild Sound Recorder drive assembly. Easily moneuvered for drilling large castings. Tilling head climinales need for angle vice and special set-up in drilling angled holes.



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Above, a Pritchard Induced Draft Tower showing patented Pritchard Ventilated Hoods for control of fresh air circulation through and around the vertical gear head motors

ritchard Atmospheric Cooling Towers are designed to give a maximum of water BREAK-UP and, through the patented Pritchard Drift Retriever, saves make-up water by reducing drift loss to a minimum.

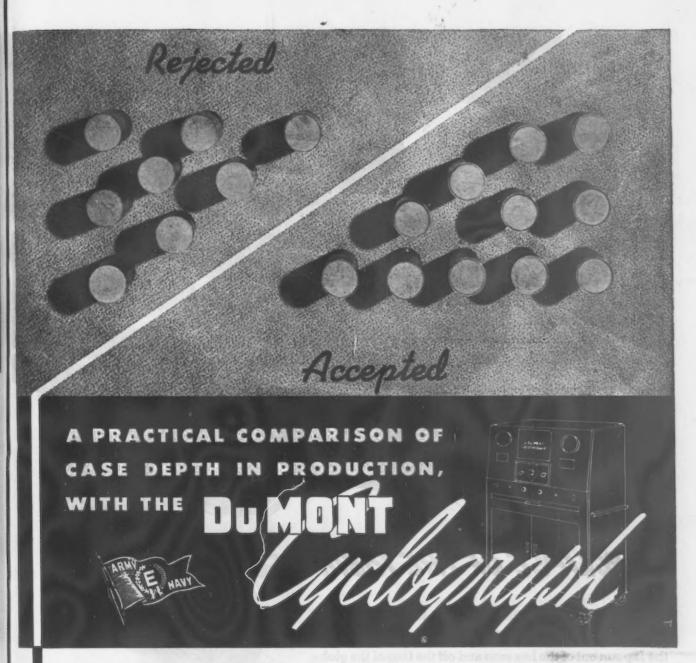
The drawing shows the functioning of this exclusive feature. The finely divided particles are entrapped by the "MIST TRAP" before they can leave the system. This water—normally lost in other designed towers—is then returned to the center of the tower by way of the louvers, retriever collector boards, drift retriever troughs and centering flumes. In this way the water in the system is kept active in doing

Pritchard retriever type towers maintain HIGH cooling capacity at LOW wind velocities because of minimum air flow restrictions.

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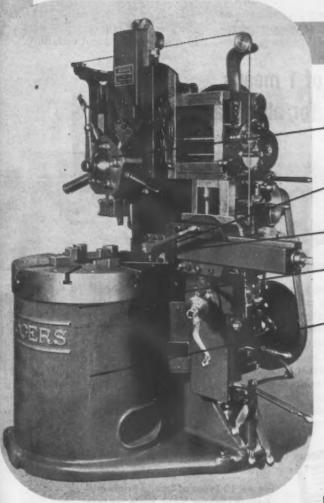
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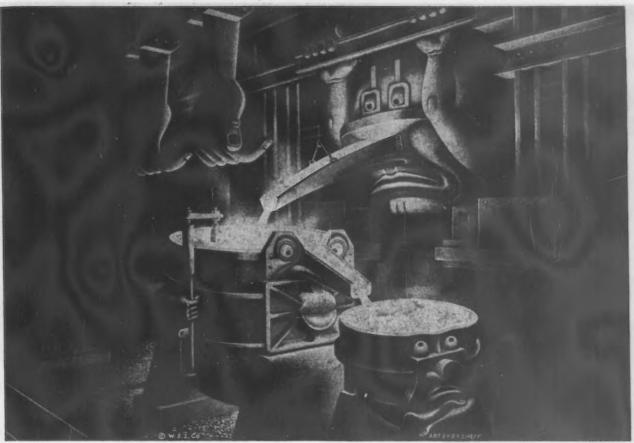
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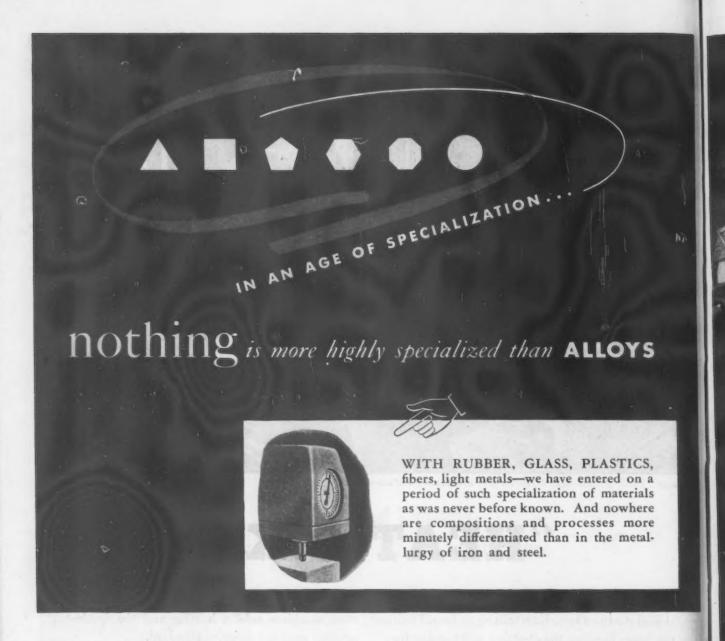
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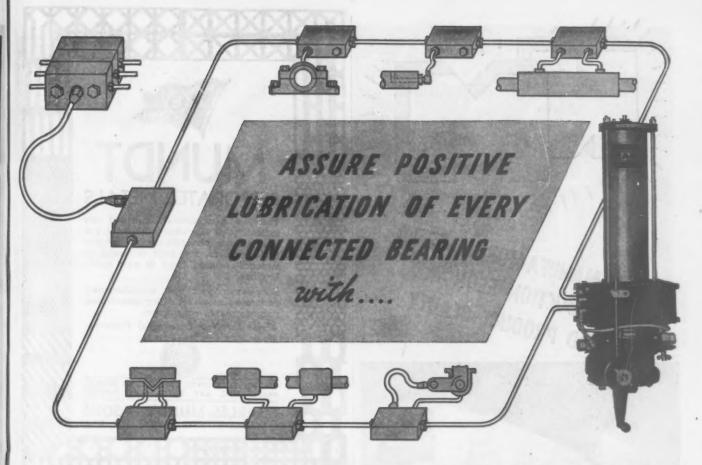
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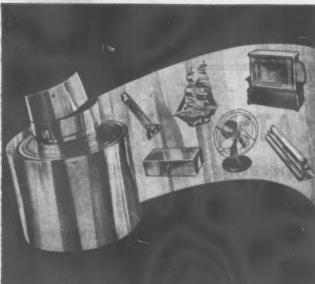
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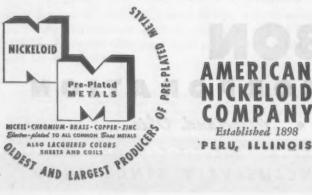
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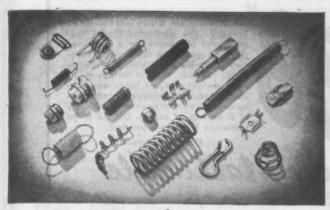
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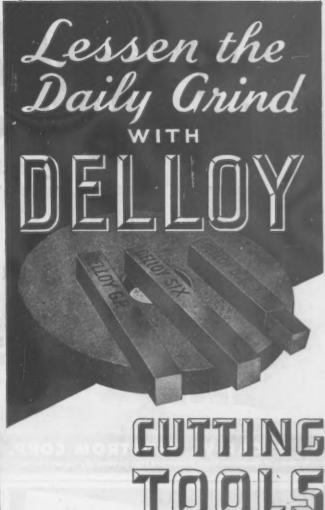
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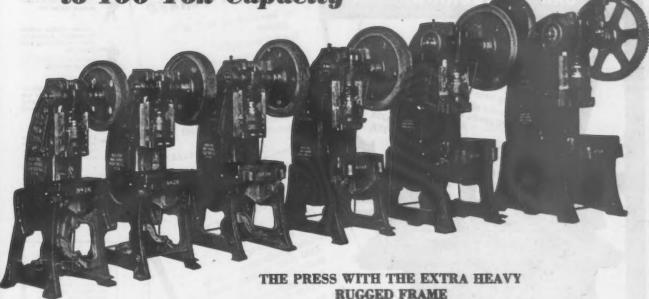
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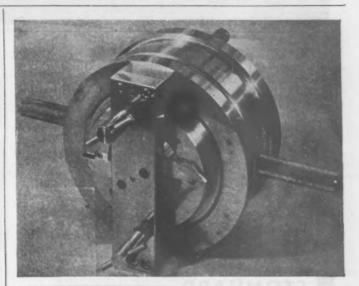
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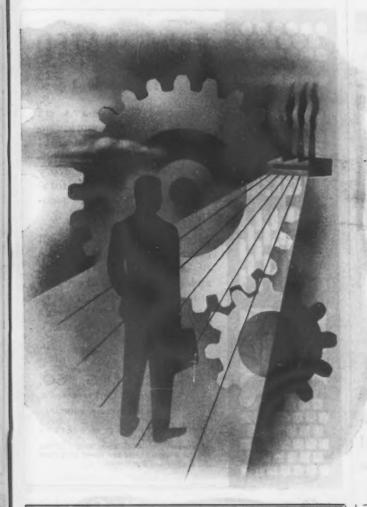
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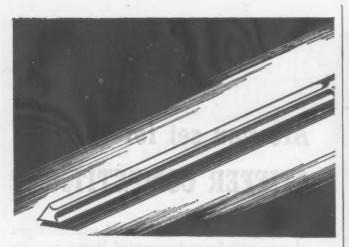
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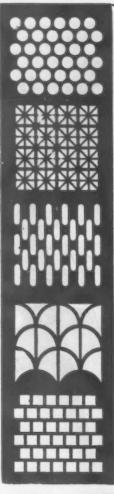
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172-THE IRON AGE, March 29, 1945



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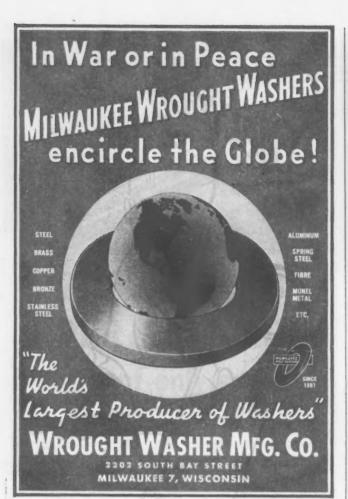
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Landis 6x20", Hydraulie, M.D.
Bryant Ne. 12, M.D.
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Hall Planetary Model D Thread Miller
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Grindin

12" x 56"

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Cranksl very la Bakewell 6"x15" Jo Grinder #39A Ex 2%" Con

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KAMI 302 Moa

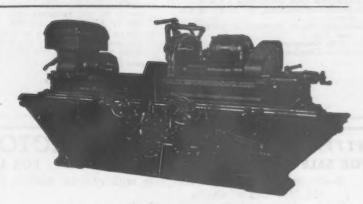
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16" Vertica 2-21/2 yd. 1-250 ton 1-1500 H. 1-1000 H. I-William 1-100 ton

1-25' Mul PS1 cor head cr Steam Loc 10' Morgan -Deane 1-Bloom 8

1-Bloom opening -Yale & tery tr

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Elweil model Edison -Elwell capacit Recond -Baker drive a

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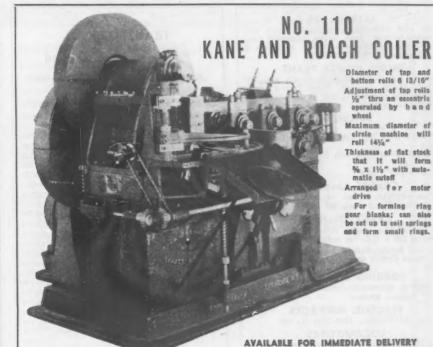
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2	100	G. E.	1	A	2200x115/230
1	100	Whse.	1	OISC	11430x250
3	100	Whse.	1	OISC	13200x250
3	100	G. E.	1	HJDD	13200x445/226
1	200	G. E.	1	H	2300x115/230
1	200	G. E.	2/3	Auto	2500x2500
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1	200	Whse,	1	SK	6600x220/440
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> > 32' W

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CATERPI P&H eat. cra Bue-Erie 20B Bue-Eric 20B
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Browning 25 t
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Vulcan 30 tor
Vulcan 25 to
Vulcan 6 ton
Plymouth 20

RICH 30 Churc

40 Ton I

Air

22 Prospec

DVERHEAD 75-Ton Ladi D.C. Mi 3-Ton She mounting

SEND ME

925 Fulton

LOC

# OVERHEAD ELECTRIC TRAVELING CRANES

Tons Make	Span	Current	Remarks
1- 5 Box	40'0"	A.C. or D.C.	Lowhead
2- 71/2 Chesapeake	35'0"	230-VDC	CG. OP.
1-8 Toledo	51'6"	230-VDC.	CG. OP.
1-10 Whiting	80'0"	440-VAC.	CG. OP.
1-15 Chesapeake	50'0"	230-VDC.	CG. OP.
1-20/5 Northern	60'0"	220-VAC.	CG. OP.

SPECIAL: (2)—I ton Shepard Stationary mounted hoists, Form S, 7½ HP. 220/440-V., 3-PH., 60-CY., 88-FPM., I-part of cable, 32' wrapping cap., Var. speed.

SPECIAL: 3-Shepard, 71/2-ton, 2-motor, cage operated. Electric Monorali Helsts, 230-VDC., all parts and motors enclosed, 20-HP., holst meters, 25/75 FPM., 40° max. lift, 4 parts %" cable, trolley motors, 10-HP., 400-FPM. These holsts designed for high lift, high speed, outdoor service. WE OFFER THESE REBUILT AND GUARANTEED.

MOTOR GENERATOR SETS

(1)-124-KW., Westghse., 250-VDC., 1800-RPM., 20-HP., 220/440-V., 3-PH., 60-Cycle motor.

(1)-274-KW., Burke, 250-VDC., 900-RPM., 50-HP., 220/440-V., 3-PH., 60-Cycle motor.

(1)—125-KW., Burke, 250-VDC., 900-RPM., aquirrel cage motor, 185-HP., 2200-V., 3-PH., 60-Cycle.

ABOVE REBUILT MOUNTED ON WELDED STEEL BASE. A.C. & D.C. PANELS AND CONTROL

(1)—800-KW., 250-VDC., compound interpole Wostghae. Generator, direct connected to Westgahe. Syn. motor, 13200-2300-V., 3-PH., 60-CY., complete, A.C. & D.C. panels and control.

-25-HP. Westghse. Syn. motor or 31.3 KVA Generator, 1800-RPM., 220-V., 3-PH., 60-Cycle with direct connected ex-elter, complete A.C. & D.C. panel and control.

(1)—100-HP. Westghse. Syn. motor, 1200-RPM., 100% P.F., 2200-V., 3-PH., 60-CY., direct connected exciter, complete A.C. & D.C. panel and centrel.

OURS IS THE LARGEST STOCK OF EQUIPMENT SUCH AS LISTED ABOVE. \*WE OWN EVERY ITEM ADVERTISED ALL AVAILABLE FOR IMMEDIATE SHIPMENT



# 230-VDC. CRANE & MILL TYPE MOTORS

		1487	Olono	
	H.P.	Make	Туре	R.P.M.
(2)	2	G.E.	C.O1803	900
(2)	3	Shaw	Class C.E.	750
(1)	4	P&H	Size 6x4	850
(1)	41/4	Westghse.	K-2	715
(1)	5	Westghse.	K-3	725
(1)	5	Westghse.	H.K2	850
(1)	6	G.B.	C.O1805	1150
(1)	6	Westghse.	McB-20	600
(1)	7/10	G.E.	M.D102 (Back Axle)	1625/800
(4)	7/9	C.W.	Size A.W.	740/580
(1)	10	P&H	Size 9x51/4	700
(5)	10/13%	G.E.	C.O1825	725/600
(1)	12	G.E.	M.D103 (C.P.) (Back Axle)	675
(10	) 14/19	C.W.	Size B.W. (Back Axle)	725/560
(1)	15	Westghse.	H.K#5	700
(1)	20	G.E.	C.O1808	650
(1)	30/42	C.W.	Size D.W.	620/520
(2)	35	G.E.	C.O1809	500
(2)	35/45	G.E.	M.D104% (C.P.)	625/500
(1)	45	Westghse.	H.K.#9	470
(1)	50	G.E.	C.O1810	725
(2)	65/85	G.E.	C.O1830	700/650
OJA	N EVE	DV ITEM	ADVEDTICED	

# AC CABE COMPA

4302 CLARISSA STREET

ADELPHIA 40, PA.

# CRANES

**Overhead Electric Traveling** 

Mergan 10 ton 39'5" apaa 3 DC motors with motor generator set to give 3 phase 60 cycle 220 volt current if required.

Gantry 5 ton 50' apan 30' lift elec. New 1941

CATERPILLAR AND LOCOMOTIVE

PAH cat. erane 19 tons cap. gas 50' boom
Buc-Eric 20B 10 ton electric crane
Byers Bearcat crane 6 tons cap.
Brewning 25 ton lecometive crane Std. gauge. Steam
Brewning truck crane 10 tons cap.
PAH truck crane, 8 tons cap. Boom 50'
Lerain Model 75A 20 ton cat. crane. 50' boom
Vulcan 30 ton saddle tank xtd. ga. steam
Vulcan 25 ton side saddle tank, steam, std. ga.
Vulcan 6 ton gas 36" ga.
Plymouth 20 ton std. ga. gas

RICHARD P. WALSH CO. 30 Church St., New York 7, N. Y. A DEPENDABLE SOURCE for

# **HEAVY EQUIPMENT**

CARS-CRANES-COMPRESSORS DRAGLINES-LOCOMOTIVES SHOVELS-TRACTORS-ETC.

WE WELCOME YOUR INQUIRIES WE WILL FIGURE WITH YOU ON YOUR SURPLUS

B. M. WEISS CO.

Girard Trust Bldg.

Phila. 2. Pa.

# We BUY and SELL

**New Surplus Pipe & Tubes** Steel Buildings Tanks Valves and Fittings Plates, Bars &

Structural Steel JOS. GREENSPON'S SON PIPE CORP. Natl. Stock Yds., St. Clair Co., III.

# FOR SALE 40 Ton Industrial Locomotive Crane

Type L—Double Drum 8 wheel—Code Boller Air & Steam Brakes—50' box boom.

L. ABRAMS
22 Prospect Place Neptune, N. J.

# OVERHEAD CRANES, ELECTRIC HOISTS & RUNWAYS

75-Ton Ladle Crane, 3-motor, 37'0" span, 230 volts
D.C. Mill type motors, 32'6" lift.
3-Ton Shepard Holst, 230 volts D.C. Stationary
mounting suitable for elevator holst or car puller.
SEND ME YOUR CRANE & HOIST INQUIRIES.

LOCOMOTIVE & CATERPILLAR

LOCOMOTIVE & CATERPILLAR
CRANES

40 too BROWNING Loce. Crane
33 too LINK-BELT Loce. Cranes
5-26 425 0410 Loce. Cranes
2-15 too INDUSTRIAL Loce. Cranes
1-10 too P44 40 Boom Gas Cat.
15 too INDUSTRIAL SO Boom Gas Cat.
R. C. STANHOPE, INC.
60 Bast 42nd St.
New York 17, N. Y.

JAMES P. ARMEL 925 Fulton Bldg., Pittsburgh 22, Pa., Tel: Grant 4449

FOR SALE Approx. 70,000 lbs. STAINLESS STEEL SHEETS

.016 x 23-15/16" x 120", type 302, 1/4 hard, annealed

Price 35¢ per lb.

Write - Wire - 'Phone

CHARLES E. BROWN COMPANY 1627 W. Fort Street Detroit 16, Michigan

# ALBERT & DAVIDSON PIPE CORP. NEW-USED-UNTESTED Ave 50th 51st St. ren 1004 Brooklyn N.

FOR SALE NEW SURPLUS SEAMLESS STEEL TUBING

4%" 0.D. x 554 Wall SAE 1026 4%" 0.D. x 1.125 Wall SAE 4130 3%" 0.D. x .554 Wall SAE 1020 WALLACK BROS. 1840 W. 74th Pl., Chicago 36, III.

IMMEDIATE DELIVERY 18/20-ton DAVENPORT STEAM LOCOMOTIVE 36" gauge Electric lights COMPLETELY OVERHAULED



# THE CLEARING HOUSE

# SURPLUS STEEL

WE ARE BUYERS OF CARLOAD LOTS OF MILD STEEL STRUCTURALS, BARS, PLATES, SHEETS, STRIP, PIPE, WIRE, ETC.

# L. B. FOSTER COMPANY

11 PARK PLACE

NEW YORK 7, N. Y.

Tele. BArcley 7-2111. Ext. 10 or 11

# For Sale-APPROX. 400,000 LBS. **NEW SURPLUS ALUMINUM** Sheet & Plate—Prime Condition

1/4", 3/16", 1/6" Thickness—All Sizes up to 8 ft. wide x 18 ft. long. Analysis guaranteed. Available for immediate shipment from our Knoxville Warehouse. Quotations on request.

ALSO Pipe, Tubing and Structural Shapes, such as I-Beams, Channels, Angles, Bar and Rod.

SOUTHERN RAIL & EQUIPMENT COMPANY

P.O. Box 458

Knoxville, Tennessee

Phone 4-3605

# FREIGHT CAR PRICES REDUCED! Now only half of recent peak prices—\$500 to \$4,250 each!

- 8, Hopper, Twin, 50-Ton
  40, Hopper, Triple, 50-Ton
  50, Hopper, Side Discharge, 50-Ton
  80, Refrigerator, 40-Ft., 40-Ton
  16, Refrigerator, 36-Ft., 30-Ton
  50, Box, 40-Ft., 50-Ton
  9, Western Automatic, 30-Yd., 50-Ton; lift doors
- 10, Magor Automatic, 30-Yd., 50-Ton; lift doors

floors 20, Flat, 40-Ft., 40 & 50-Ton 70, Gondola, All-Steel, 40-Ft.; 16 Drop-Doors 6, Gondola, Steel, 50-Ton, High Side 10, Tank, 8000-Gallon, 40 & 50-Ton Trucks All cars are priced to sell

IRON & STEEL PRODUCTS, INC.

13496 S. Brainard Ave., Chicago 33, III. "ANYTHING containing IRON or STEEL"

# FOR SALE

40-Ton American and 30-Ton Vulcan saddle tank locomotives. Many other sizes and types.

All kinds of railroad and dump cars. Locomotive, truck and crawler cranes—5 to 35 tons capacity.

# **GASOLINE TRACTORS**

Allis-Chalmers, Model K, with and without blade. International Model T-20 with blade.

Trucks and truck trailers of all kinds.

Hoists—Derricks — Compressors — Generators.

# THE HARVEY LEFEVRE CO.

500 Fifth Ave. New York 18, N. Y.

TELEPHONE PENNSYLVANIA 6-3175

# LOCOMOTIVES

\* 25, Dump, Koppel Automatic, 20-Yd., 40-Ton; Lift Doors

1, Dump, Koppel, Drop-Door, 20-Yd., 40-Ton; steel floors

4, Dump, Western, 20-Yd., 40 & 50-Ton; steel

- -6-Ton Gas Locomotive, 36" Ga. Milwaukee Locomotive Works
  9-Ton, Gas. 36" Ga. Whitsomb
  9-Ton, Gas. 36" Ga. Whitsomb
  -30-Ton, 0-4-0 Davenport, A.S.M.E. Bolier
  -35-Ten, G.E. Electric Locomotive, 250 Volt, D.C.
  -50-Ton, 0-6-0 Vulcan Locomotive, 250 Volt, D.C.
  -60-Ton, Baldwin-Westinghouse Electric Locomotives, 1500 D.C., New 1927
  -60-Ton, Westinghouse Electric Locomotive, 550 volt, D.C.
  -60-Ton, Baldwin-Westinghouse Electric Locomotives, 1500 volt, D.C.

- volt, D.C.
  2-60-Ton. Baldwin-Westinghouse Electric Locomotives, 1500 volt, D.C.
  2-85-Ton, G.E. Electric Locomotives, 600 volt, D.C.
  1-65-Ton, 2-6-0 Mogui Locomotive, 0il-Burning
  1-80-Ton, 0-6-0 Lima Switching Locomotive, T.E.
  35,300#. Built 1925. Excellent condition
  1-50-Ton, 0-6-0 Baldwin saddle tank locomotive
  1-80-Ton, 0-6-0 American saddle tank locomotive

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# RELAYING RAILS

(MACHINED STRAIGHTENED) and accessories Immediate Shipment

MIDWEST STEEL CORPORATION ARLESTON WEST VIRGINIA CHARLESTON

# RAIL-ACCESSORIES RAILWAY EQUIPMENT

BOUGHT SOLD BULIER STEEL PROBUCTS, Inc.

**NEW AND** RELAYING

TRACK ACCESSORIES

from 5 Warehouses

- SHIPMENTS · PROMPT
- FABRICATING FACILITIES
- TRACKAGE SPECIALISTS EVERYTHING FROM ONE SOURCE

# **B. FOSTER COMPANY**

PITTSBURGH NEW YORK

# CARS

SPECIAL 100-All Steel 50 TON Hoppers

- 85—40 ton steel u/f flats.
  20—50 ton steel u/f flats.
  15—30 ft. all-steel Gons. Al condition,
  100—30 ton steel u/f box cars.
  25—30 ton all-steel Gons.
  25—30 ton steel Gons.
  8t. Ga. Bit. 1928.

LOCOMOTIVE CRANES Saddle Tank Locomotives

# RAILS

Complete Stocks at 90x 85x 75x 70x 65x 60x and lighter weights, with angle bars, carried at principal points throughout the country, available for rail or water shipment.

HYMAN-MICHAELS COMPANY

122 So. Michigan Ave.

Chicago 3

**New RAILS Relayers** 

All sizes and weights. Also frogs, switches, spikes, bolts, tie plates, contractors' and mine equipment carried in stock.

Reac, Nevade
New York, N. Y.

Havana, Cuba M. K. FRANK Park Bidg.
Pittsburgh, Pa.
Carnegie, Pa.

# WANTED

WANTED
PRESSES: — inclinable — Double Crank and
Straight Side—All Sizes
WELDERS:—Spot-Butt and Seam
SQUARING SHEARS AND PRESS BRAKES

FRANK J. LUNNEY

"METAL WORKING MACHINERY"
1700 CAMBRIA ST. PHILA. 82. PA.

WANTED

SQUARING SHEARS WITH RUN-OUT TABLE FOR 3/4" to 1/2" PLATE x 10'-0" WIDE. STATE CONDITION AND PRICE.

A. O. SMITH CORPORATION HOUSTON, TEXAS

WANTED

**Electric Overhead Traveling Crane** approximately 48'0" span 5 to 10 ton capacity

NATIONAL BENT STEEL CORP. 5307 Metropolitan Ave., Brooklyn 27, New York

**Highest Prices Paid** 

# SCREWS-BOLTS-NUTS

BROADWAY BOLT & 3CREW CO.

29 Bushwick Ave., Bklyn. 11, N. Y.

WANTE \$6, \$7, CHICAGO SAN FRANCISCO Care The Ire

14 gage B 231/2" by 16 gage Bla tiples. 4" O.D. Tu

Rating AA

SIEBRING

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184-THE IRON AGE, March 29, 1945

WANTED

14 gage Black Sheets, minimum width 23½" by 26" or longer.
16 gage Black Sheets, 16" by 23" or multiples.
4" O.D. Tubing, 14 gage sidewall.
Rating AA-4 Ex-allotment.

SIEBRING MFG. CO., George, lowa

# WANTED—SURPLUS MATERIAL \$6, \$7, or \$8 Basic Wire in Coils

ADDRESS BOX Z-302 Care The Iron Age, 100 E. 42nd St., New York 17

WANTED STEEL BARS STEEL PLATES STRUCTURAL STEEL

> BARON STEEL CO. TOLEDO 12, OHIO

# WANT TO BUY

Relaying Rails all Sizes Railroad Cars Locomotives and Equipment SONKEN-GALAMBA CORP.
KANSAS CITY 18, KANS.

"ANYTHING containing IRON or STEEL"

40 years' experience MORE FOR YOUR DOLLAR

# Wanted

# HSED ELECTRIC STEEL MELTING FURNACE

CAPACITY:

500 to 1000 POUND BATCH

ADDRESS BOX Z-329

Care The Iron Age, 100 E. 42nd St., New York 17

# WANTED

Uncellers 7"

Press Brakes 8' to 15', 1/8" to 1/2"

Blower 30,000 C.F.M. or larger Punch Presses Flywheel Type 15 ton to 30 ton 30" throat

Punch Presses Gear operated 40 to 50 tens 30" threat

runen Presses Gear operated 40 to 50 tens 30" threat Bending Rolls for ¼" x 6' to 10° plate Squaring Shears ½", ¼" & ½", 6', 8', 10', 12" 200 ten Blanking and Drawing Press, Bed plate 45x65" streke 8" to 10"

75 to 80 ton inclinable open back Press (Gear type) with pneumatic pressure cushion, Bed plate 30"x40" stroke 6"

Slag buggles

Siag buggles
Compressor 50 to 2000 C.F.M. 60 to 125# Pressure
30" Universal Mill with tables and drive
Shear Knife Grinder 156"
Accumulator 14" dia. x 12" with 15" ram
Conveyors—magnetic pulleys

Core Drying Oven

BENKART STEEL & SUPPLY CO.

2017 PREBLE AVENUE, N. S. PITTSBURGH 12, PA. CEdar 4440

# WANTED-SURPLUS STOCKS GASH

BARS, SHAPES, PLATES, SHEETS

CARBON, ALLOY or STAINLESS STEELS

Hot Rolled or Cold Finished Prime quality and carload quantities only

PETROMETAL EXPORT CORP. Broadway at 11th St., Long Island City 2, N.Y.

# WANTED

Surplus Strip Steel:
.000" thick 31/4-31/24" with

Surplus Strip Aluminum:
.020" thlek 31/4-31/4x4" wide
.020" thlek 73/4x74/4" wide
.025" thick 85/4" wide

Surplus Bright Steel Wire .0258" Dis. Lew Carbon .030" Dis. Approx. .40 Carbon .031" Dis. Approx. .40 Carbon

Surplus Spring Steel Flat Wire:

.008" te .010" thick-3/16" wide We are interested only in materials in first class conditios.

We are manufacturers.

ADDRESS BOX Z-304
Care The Iron Age, 100 E. 42nd St., New York 17

# BUSINESS OPPORTUNITIES -

# WANTED TO BUY

Principals long established and experienced in machine shop business are interested in buying for cash any established manufacturing business.

We prefer such opportunities where after sale, personnel will remain and where the present owner will continue to supervise production at an attractive salary. We would furnish over-all management, supply orders, new equipment. salary. We would furnish over-all man-agement, supply orders, new equipment, capital, etc.
Send brief description of product and activity with first letter.
Area within 30 miles of Newark, N. J.,

ADDRESS BOX Z-159
Care The Iron Age, 100 E. 42nd St., New York 17

# YOUR PRODUCTION PROBLEMS SOLVED

We are prepared to furnish that immediate, practical answer to your problems in machining, forming, forging, shaping or stamping steel. Write us concerning your difficulties with steels in either carbon, alloy stainless or tool steel grades.

STEEL PROBLEMS ANALYSIS S. Trenton Avenue Pittsburgh 21, Pa. 427 S. Trenton Avenue

Planning to buy a plant? What you are looking for may be in The Iron Age Look here first.

# WANTED

# POST WAR PRODUCTS

We have Modern Building suitable for manufacture of Heavy or Semi-Heavy Metal Products. 120,000 sq. ft. Electric Power. Steam Plant for heating and processing. Air Supply. Docking and Railway Facilities.

We welcome inquiries from U. S. Manufacturers desiring a Canadian outlet for their product.

THE CANADIAN BRIDGE COMPANY, Limited Walkerville, Ontario

# WE WILL BUY

a going industrial business for cash, and for our own account. Prefer a transaction involving over \$100,000.00.

Write to

Industrial Dept.

TRIPLEX MACHINE TOOL CORP.

125 Barclay St. N. Y. 7

# PLANTS FOR SALE

MACHINE SHOP. Good building and tools. Now have orders for \$500,000. Price \$100,000. Present management can remain.

FOUNDRY. Jobbing iron foundry with well established customers. Property in excellent condition. Price \$45,000. Terms.

MACHINE & STEEL FABRICAT-

ING SHOP. Equipped to produce machines where welding and machine work required. Fifty employees. Price \$35,000.

MACHINE SHOP & FOUNDRY. Buildings only. Well laid out plant of 24,000 sq. ft. Extra land. Price \$30,000.

EDWARD H. ZOLL

Industrial Properties Throughout the East.
Broad St. Newark 2, N. J. 790 Broad St.

# MANUFACTURING PLANT

MANUFACTURING FLANT

Long established; large Ohio city; employing 200; own building 50,000 sq. ft. floor space, machine shop, brass, brenze and aluminum foundry, assembling, polishing, finishing, etc.; manufacturing vital parts for ships, etc.; peacetime products (architectural and ornamental metal work for buildings), large post-war demand; price, \$325,000 cash or marketable securities in exchange for all the capital stock of the company.

ADDRESS BOX Z-357

Care The Iron Age, 100 E. 42nd St., New York 17

# BUSINESS OPPORTUNITIES

# FOR SALE

Complete tooling and engineering plant located in one of this country's outstanding tool centers. Equipment and facilities to handle the most difficult precision work. Our client invites inquiries and plant inspection. Unfilled contracts now on hand are approximately one million dollars.

Inquiries to:

NATIONAL PUBLIC RELATIONS SERVICE Southern Building, 15th & H Streets, N.W. Washington, D. C. Phone: District 1224

# EMPLOYMENT EXCHANGE

# **EMPLOYMENT SERVICE**

EXECUTIVES AND TECHNICAL MEN Since 1915 we have served thousands of High Grade Men in contacting responsible employers for suitable positions. All overtures are strictly confidential and do not conflict with Man Power Commission rulings. Submit complete record for proposal.

NATIONAL BUSINESS BOURSE Personnel Negotiations
20 W. Jackson Blvd. — Chicago 4, Ill.

SALARIED POSITIONS—This advertising service of 35 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee and present position protected. Send for details. R. W. BIXBY, Inc., 274 Delward Bldg., Buffalo 2, N. Y.

# HELP WANTED

METALLURGIST, CHIEF. Experienced as metallurgist for manufacture of steel products, especially with reference to austenitic steel. Must have degree of Metallurgical Engineer. Should have knowledge of radiography. Good post war prospects in present essential industry located in Midwestern city. Statement of availability required. Address Box Z-363, care The Iron Age; 100 E. 42nd St., New York 17.

DESIGN ENGINEER, must be thoroughly experienced with all types of manufacturing: Die Casting, Production Line Assembly, Etc. Plant located in Metropolitan N. Y. Excellent Opportunity! Permanent Post-War Position! WMC Regulations apply. Give complete record of Experience, Qualifications and salary desired. Address Box Z-332, care The Iron Age, 100 E. 42nd St., New York 17.

# HELP WANTED

# TWO DRAFTSMEN

One experienced in heavy machinery design—the other in Fans and Axial Blowers. Excellent future for right man, with old established Southern Ohio company.

Statement of availability required, etc.

ADDRESS BOX Z-362
Care The Iron Age, 100 E. 42nd St., New York 17

WANTED—an Assistant General Superintendent, must know sheet and steel plate fabrication from 16 gauge to 1½" in thickness, be capable of getting maximum production out of Department Foremen and men. Must be a hard worker, not over 42 years old. Give past fifteen years' experience. Good salary for party that can qualify. Statement of availability required. Address Box Z-36, care The Iron Age, 100 E. 42nd St., New York 17.

EXPORT MANAGER—Position requires Man with extensive prewar experience in Export; knowledge of Steel products, Chemicals, Machinery, Foodstuffs; initiative and resourcefulness; ability to originate business and supervise; excellent opportunity. State fully past record, remuneration. Statement of availability required. Address Box Z-365, care The Iron Age, 100 E. 42nd St., New York 17.

ASSISTANT SUPERINTENDENT Industrial Relations wanted by steel plant in Chicago

rial Relations wanted by steel plant in Chicago area. Broad experience in industrial relations activities required. State age, education, experience and salary desired in first letter. Statement of availability required. Address Box No. 7811-A, care The Iron Age, 1134 Otis Bidg., Chicago 3.

AUTOMATIC SCREW MACHINE MAN to take full charge Automatic Screw Machine dept. B. & S., Cleveland and #52 and #56 Acmes. Statement of availability required. Address Rox Z-334, care The Iron Age, 100 E. 42nd St., New York 17.

# EMPLOYMENT EXCHANGE

HELP WANTED

# **WORKS MANAGER** WANTED

company normally employing 1100 is looking for as capable Works Manager. Essential requirements are a sound engineering background and experience in building high grade medium and heavy machinery. He should have the ability to plan and direct quality production, secure results economically and have the knack of getting others to work with him and for him. His own enthusiasm should be contagious. An old established Company with progressive policies and modern plant has a real opportunity and future for the right man. Company at present 100% in war work but has standard line of pre war nationally recognized products for post war years. Write full details as to experience, etc., including earning record. Correspondence considered in confidence, with no references contacted without first being released by you. Statement of availability required.

ADDRESS BOX Z-359 Care The Iron Age, 100 E. 42nd St., New York 17

WANTED

Superintendent for Flat Die Ferging Plant. Must be capable of taking complete charge of preduction, estimating, etc., in Flat Die Hammer Shop. Must be real producer and able to handle men. State full details of qualifications, prior experience, age. etc.

Statement of availability required. ADDRESS BOX Z-330 Care The Iron Age, 100 E. 42nd St., New York 17

# **DESIGN ENGINEER**

Familiar with hydraulic mechanisms and general machine design by manufacturer in Middle West as assistant to Chief Engineer. Permanent. Give age, experience, present salary, etc. All replies confi-

Statement of availability required.
ADDRESS BOX Z-366 Care The Iron Age, 100 E, 42nd St., New York 17

MECHANICAL DRAFTSMAN WANTED for small concern located in Indiana. Company is now engaged in war work but the position will remain when we revert to our peace time product of musical instruments. In reply please give full details as to age, draft status, salary required, etc. Statement of availability required. Address Box Z-361, care The Iron Age, 100 E. 42nd St., New York 17. MECHANICAL DRAFTSMAN WANTED

New York 17.

WANTED — Forge Foreman. Post-War job Excellent opportunity for capable man experienced in Drop Forging. All board hammers. Give de tails of experience, qualifications, salary desired, agc, etc. Statement of availability required. Address Box Z-353, care The Iron Age, 100 E. 42nd St., New York 17.

SCRAP MEN WANTED—A scrap brokerage company has several openings for men experienced in iron and steel scrap. Men who can qualify will be given choice of territory. Work will consist of buying scrap from dealers and industrial plants. Statement of availability required. Address Box Z-354, care The Iron Age, 100 E. 42nd St., New York 17.

WANTED—Designer, Draftsman & Estimator.

WANTED—Designer, Draftsman & Estimator, Must have full knowledge of A.S.M.E. construction on all types of pressure vessels and other complicated steel plate construction of refining equipment, etc. Plant located in Texas. Statement of availability required. Address Box Z-339, care The Iron Age, 100 E. 42nd St., New York 17.

MASTER MECHANIC able to supervise maintenance and construction in Specialty Steel Mill in Pittsburgh District. Statement of availability required. State experience and salary expected. Address Box Z-340, care The Iron Age, 100 E. 42nd St., New York 17.

SPRING MAKER in short order department.

SPRING MAKER in short order department. High wages. Now on War work, but postwar work and position assured. Give full details of qualifications, prior experience, age, and references. Statement of availability required. Address Box Z-348, care The Iron Age, 100 E-42nd St., New York 17.

DISCHARGED VETERANS OF WORLD WAR II interested in learning a trade are invited to write the H. & A. Selmer Company, Jesse French Mfg. Div., New Castle, Indiana. Applicants selected will be given training in the building and mechanics of pianos. Musical ability desirable but not essential. In reply give complete information as to age, marital status, salary requirements, etc.

REPRE

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produ Liber

AMB Exceptional AAA prod Agencies a rication of territories from \$150 Technical Essential have abilit

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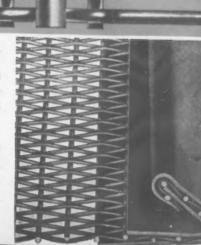
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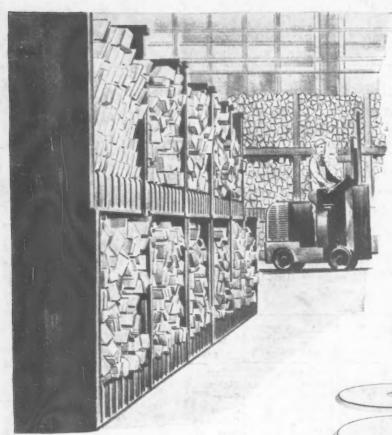
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